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THE

MECHANICS' MAGAZINE,

MUSEUM,

Register, Journal,

AND

GAZETTE,

APRIL 1—OCTOBER 1, 1832.

VOL. XVII.

"Make public opinion shall be brought to bear upon the world of science. Light will be thrown on the subject of bats, and the prejudice and the charlatan will be driven. Too modest observers [illegible] without the action of public opinion, any administration, however anxious to encourage the promotion of science, and however ready to reward by wealth or honour those whom they think most deserving, would run the risk of acting like the blind, man recently restored, who, having no means of estimating degrees of distance, relished the nearest and most insignificant as the largest objects in nature."—Babbage.

LONDON:

PUBLISHED BY M. SALMON,

MECHANICS' MAGAZINE OFFICE,

WINE OFFICE COURT, FLEET STREET.

1832.

THE

MECHANICS' MAGAZINE,

MUSEUM,

Register, Journal,

AND

GAZETTE.

APRIL 1—OCTOBER 6, 1832.

VOL. XVII.

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PUBLISHED BY R. SAUNDERS,
MECHANICS' MAGAZINE OFFICE,
WELLINGTON HOUSE, FLEET STREET.

1832.

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PREFACE

TO

VOLUME SEVENTEENTH.

THE friends of knowledge are often reproached with the fact, that notwithstanding the great efforts which are making to enlighten the minds of the people, and to increase their skill in the various arts which contribute to human sustenance and comfort, there is no diminution observable in the general sum of poverty and misery, and their invariable attendants, profligacy and crime. Had knowledge ever been proposed as an all-sufficient remedy for the evils of our social condition, there might be some ground for this reproach; but the utmost that the wise and good have ever anticipated from it (whatever others may have said or done), has been, that it would interpose a check to the fast-spreading corruption of the times—lighten the pressure of the population on the means of subsistence—and prepare the way for the introduction of a number of auxiliary measures, scarcely less essential than knowledge itself to the well-being of the country. To know what influence the schoolmaster has had on the character and fortunes of the age, we ought to ask ourselves—how much greater the sum of poverty, misery, profligacy, and crime would have been had none of those efforts for the diffusion of knowledge—of scientific knowledge in particular—been made, which are a favourite theme of derision with fools and bigots? We ought to ask ourselves, how much the produce of our arts and manufactures has been augmented by the light which science has thrown on their operations, and by the greater

"When we reflect," says Mr. Babbage, "on the very small number of species of plants, compared with the multitude that are known to exist, which have hitherto been cultivated and rendered useful to man; and when we apply the same observation to the animal world, and even to the mineral kingdom, the field that natural science opens to our view seems to be, indeed, unlimited. These productions of nature, numerous and varied as they are, may each on some future day become the basis of extensive manufactures, and give life, employment, and wealth to millions of human beings. But the crude treasures of nature; perpetually exposed before our eyes, contain within them other and more valuable principles. All these, in their innumerable combinations, which ages of labour and research can never exhaust, may be destined to furnish a perpetual succession of new sources of our wealth and of our happiness."

Among the periodical works specially devoted to this seemingly boundless field of research, the Mechanics' Magazine continues to occupy the same prominent place which it has done since its commencement—still possessing a larger circulation than any other Scientific Journal, and, as may fairly be inferred, still possessing superior claims to the preference it enjoys. In that, which has been always one of the best features of the work—its original correspondence—it has been a gainer by increase of years; for instead of having, as at first, friends at home merely, to thank for their support, we have now to make our grateful acknowledgements to a circle of correspondents, which includes in dwellers of all countries "from Indus to the Pole," and in-whose contributions the reader will probably find his best compensation for the hours he may devote to a perusal of the volume which we now commit to his friendly protection.

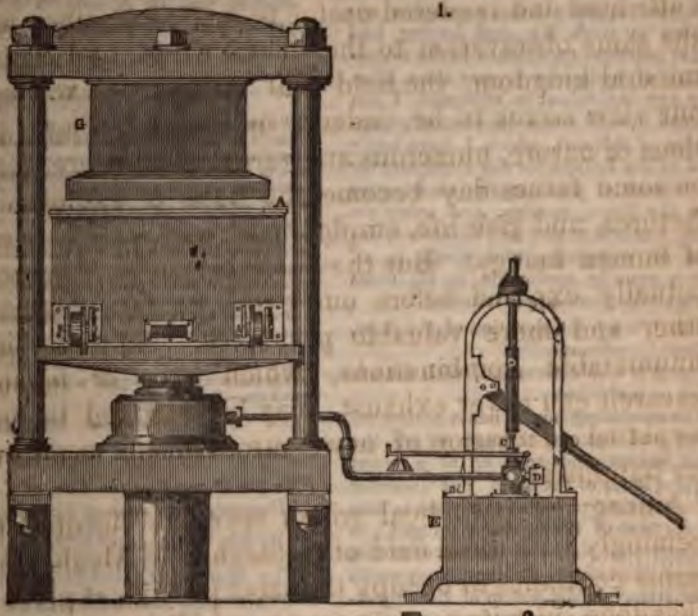
Wine-Office Court, 29th September, 1832.

Mechanics' Magazine,
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 452.] SATURDAY, APRIL 7, 1832. [Price 3d.

RUSSELL'S HYDRAULIC PRESS.

1.



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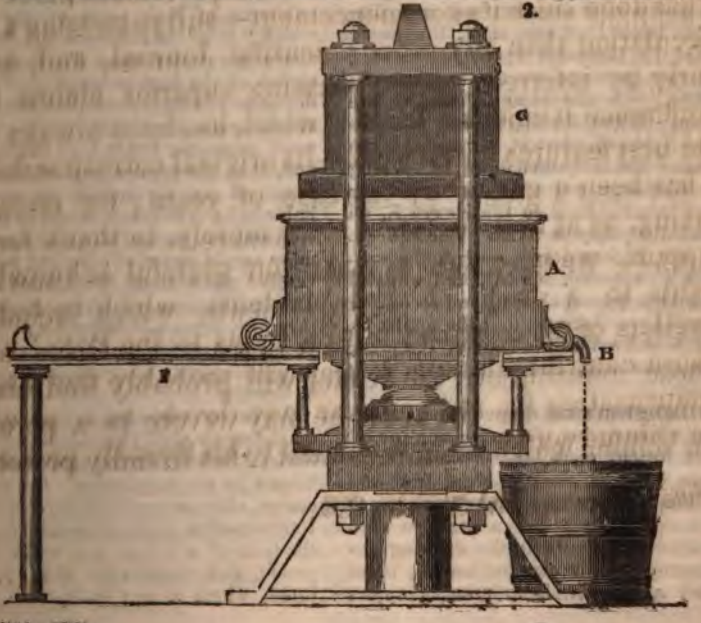

RUSSELL'S HYDRAULIC PRESS.

Sir,—Seeing in No. 123 of the Mechanics' Magazine, an engraving and description of an Hydraulic Cider Press, with what appears to me, a complex apparatus to work it; and having had longer practical experience in the manufacture of hydraulic presses than I believe any individual in existence, I am induced to send you a drawing of an apparatus of this sort, which I have lately fixed at the Refuge for the Destitute, for the purpose of pressing the rinse water from the linen, woollen, and other articles, washed at that establishment, instead of wringing; and which is, of course, equally applicable in all cases where similar pressure is required.

Fig. 1 is a front elevation of the press, without its railways.

Fig. 2 is a side elevation, with the addition of the railway.

The squeezing box A has a perforated lining and bottom, through which the water passes, and runs off at a spout B at the back of the box. The diameter of the working piston of this press is four inches, that of the injecting pump C, is one inch diameter, and the power of this press on the article submitted, is upwards of 30 tons. If the piston of the injecting pump were one half an inch diameter instead of one inch, the power would be increased four-fold, that is, 120 tons pressure on the articles submitted, with the same labour at the pump. When the linen, &c. is sufficiently pressed, that is, almost dry, the pressing box is lowered down, by opening the discharge valve D, on which the water returns back to the cistern E, on which the pump is fixed. The squeezing box is then drawn out on the railways F, emptied, refilled, and wheeled back for a second charge, and so on. I should have observed, that the mallet G, which is fixed to the head of the press, enters the box, and is made to fit it nearly.

Having made and erected many presses of this description, for expressing the oil from various seeds, the molasses from sugar, &c. their power varying from 500 to 1000 tons pressure, I take leave to ask your opinion, whether a press so constructed and shown in the drawing accompanying this communication, is, or is not, as applicable to pressing apples for cider, pears for perry, or any other fruit in a superior manner to the methods which have already appeared in the Mechanics' Magazine?

Should you be of opinion that it is superior, you will probably be inclined to give it a place in your truly useful work.

Yours, &c. W. RUSSELL.

[We see no reason to doubt that this press of Mr. Russell's is as applicable to the expression of the juice of apples and pears, as to any of the other purposes to which it has been so successfully applied. Neither can we refuse to acknowledge, that it is, in point of simplicity and probable efficiency, superior to any thing of the kind which has yet appeared in our pages. Our Devonshire and Herefordshire friends must feel obliged to Mr. Russell for making this description of it public. We have seen a sugar-apparatus fixed on this plan, in which there are two boxes running alternately on the railway, so that the sugar in one box is submitted to the action of the press, while the contents of the other are removed, and a fresh charge put in, ready to wheel into the press as soon as it is at liberty; by this means nearly double the usual quantity of work is done in the same time.—ED. M. M.]

THE OVERFLOWING OF THE OHIO.

Plan for Preventing the Loss of Life and Property in all cases of Inundation.

By Mr. M. ROUGH, Schoolmaster.

The Morning Chronicle of the 22nd March records the sufferings of the inhabitants of both sides of the Ohio, which "rose" in February last "64 feet above low water mark!" Perhaps no stretch of the human imagination could devise an effectual preventive remedy for all the evils that such an inundation must occasion; but it is an indisputable fact, that the greater part of the losses sustained by the people in countries liable to be overflowed, might be prevented; and no part of the globe possesses more ample means of adopting such preventive plans than the United States. The publication of these plans will, therefore, prove a blessing not only to the people of America, but also to all people in all countries, where inundations may be dreaded.

A year or two ago, a town or village on the estate of O'Donoughoe, near Killarney, Ireland, lost several of its inhabitants by an inundation. On that occasion, after two or three days' reflection, I composed a work, minutely detailing the form of a cottage that would be fire-proof; and capable of floating, uninjured, where it was built, with all its

inhabitants, furniture, cattle, &c. in perfect safety. Circumstances that I could not controul, occasioned me to consign this manuscript to the shelf, where it rests in dumb oblivion, with a hundred more, the labour of many hours during the last twenty years.

My design was to have the frame of the cottage put together by rules of art, such as are well known to architects, or good house carpenters; but to make the bottom water-proof, and capable of sustaining any burthen that would not sink it beyond a given depth; I proposed having the first bottom outside, and to have the floor and bottom secured by screws and bolts passing through the beams and rafters. This, when the cottage floated, would prevent the floor from starting, which would inevitably take place, if the floor were laid after the ordinary manner of the floors of houses. Now, if we imagine the cottage 12 feet high, half the height should be water-proof, and there should be an ascent by steps to the door. In poor cottages, there should also be a descent by stairs to the floor; but in others, the floor might be on a level with the lower part of the door; and by having trap doors, or hatches, the space between the bottom and first floor would be a store, resembling a ship's hold.

The steps should be ladders, hooked above to eye-bolts; and from the lower part, iron stancheons should rise, to which man-ropes being fixed, the upper end of the man-ropes should lead through sheaves in the uprights of the cottage; to small cleats inside, the man-ropes should be belayed; and in case of necessity, the ladders could be instantly drawn up to prevent them being carried away by a flood.

The beams and rafters forming the foundation, should project outside of the walls, more or less, in proportion to the size of the buildings. On these, troughs for holding water, victuals, &c., could be erected, and these would be serviceable to cattle at all times.

At the gable end of the building that would first be struck by the flood, a chain cable could be placed in a box, and a little practice would teach every man and woman, how to pay away in case of the flood rising.

MICHAEL ROUGH.

21, Earl-street, Seven Dials, London,
March 26, 1832.

STEAM VESSELS OF WAR.

Sir,—To render steam boats fit for war, requires a better combination of construction and arming than our official people seem to be aware of. The Salamander, at Sheerness, and the Dee, at Woolwich, will both be useless as men of war; the former has sufficient depth of hold, but is built so sharp that she will not stow more than ten day's fuel when her stores and guns are on board; the latter is sufficiently flat, but so shallow that she also will stow little more than the former; and I understand those at Plymouth and Chatham are in the same predicament. A steam vessel of war ought neither to be so fine as a sailing vessel, nor, on the other hand, have the capacity of an Indiaman; in the first case, she would not stow a sufficient quantity of fuel, and would draw too much water for most purposes—in the latter case, she would not go with sufficient rapidity. Her floor should not be quite flat, but nearly so; its length should occupy half the vessel, the form of the bow and run should occupy the other half; the dimensions of the vessels building are thirty feet wide, and a hundred and sixty-five feet long; had they been twenty feet deep, and built in the above form, they would have been efficient vessels. I beg it to be fully understood, that I do not propose this as a vessel offering the least resistance in the water, but as one combining the requisites necessary for a steam man-of-war; such a vessel, when light, would draw little more than four feet water, without including the keel, whose depth should be according to circumstances, and quite independent of her construction. Her engines and boilers would immerse her between six and seven feet, and with about eight hundred tons of coals she would draw about fourteen, having her gun deck six feet above water at her greatest loading. With a two hundred horse engine, she would consume twenty tons of coals a-day, and if they were good, with great care, something less. The shaft should be as close to the deck as possible, and the diameter of the wheels about twenty feet; when loaded, to fourteen, the paddle boards should shift up, so as to reduce the diameter of the wheel to about fifteen feet; as the coal was expended, the boards should be

shifted down till they came to their full extent; the coal boxes should be fitted in compartments, to receive water, in order that the wheels may remain sufficiently immersed as the coals were expended. The engine and boilers should be secured against shot, which has not been thought of in any of our vessels; no man will be found to attend them in their present state; men have long made up their minds on going into action to be killed or wounded, but I never heard of any who are ready to be boiled. It has been proved that a combination of oak timber, iron plates, bales of linen, leather, or reams of paper, five feet thick, would protect the boiler and engine against an eighteen-pound shot, and without that protection a steam boat is entirely useless in war. The wheels must, of course, be exposed; but if the naves, which are at present of cast, were made of wrought iron, and the arms of the wheels connected with plates, it would require many shot to disable them. The main shaft would then be the only vulnerable part, and if the guards which support it are considerably rounded, or, indeed made like a cuirass, and covered with plate iron, they would glance off any shot. With these precautions, wheels would be less subject to accidents than either masts or yards. Experience has proved, beyond a doubt, that the fittest vessels for sea are those constructed with the wheels buried in the side, as the Irish steamers are. I believe the Salamander is built in this manner; the spencing of the Dee only covers one half the wheels—they are a great deal too wide. She will certainly go the faster in the river Thames (which is the only thing the engineers and builders think of); but in rough weather, such wheels will never be under command of the engines. I am not aware how it is intended to arm our steam boats; I should propose as many heavy guns on pivots as possible; on the upper deck and between decks, two bow-chasers: no arrangement of that nature seems to be intended in those now building. They should be rigged as three-masted schooners, with the lower masts in two, having topsails topgallant sails, and royals, and all the necessary sails for common purposes, which, with the exception of the lower *part of the lower masts,* could be got down when it was necessary to steam against the wind.

am, &c.

A GREAT ADMIRER OF STEAM BOATS.

(*United Service Journal for April*).

EMIGRATION TO CANADA.*

We have now before us the second publication on the subject of our possessions in North America, sent forth within these few months. Colonel Bouchette's work we have already disposed of; and it now remains briefly to discuss the merits of that of Mr. M'Gregor, which has made its appearance so closely on the heels of the other, that it "galls his kibe." Mr. M'G. was for many years a resident in British America, and the results of his observations, with statistical details from Government returns and other resources, combine to form the matter of his two valuable octavos. A great proportion of their contents, however, as might have been expected, has been forestalled by the writer who managed to be "first in the market" (Mr. Bouchette); and, perhaps, both are chargeable with a want of that complete method and arrangement naturally looked for in productions which aim, in a certain degree, at standard excellence. Our present author, also, devotes a very large portion of his space to the History of the Colonies, and especially to the exploits of their first discoverers,—events which have no very great influence on their present state, or the actual condition of their inhabitants, and which might have been dismissed, to the satisfaction of the reader for information, in a much smaller number of pages. The chapters which relate to the prospects of the emigrant, are of course the parts of the book most interesting and most important, and on which Mr. M'Gregor has bestowed the greatest degree of attention. He concurs with almost every writer on the subject, in allowing that Canada and the rest of our North American colonies, hold out the fairest prospects of success to the prudent and industrious settler,—although he warmly deprecates that precipitate emigration,

* British America; by John M'Gregor, Esq. In 2 vols. Edinburgh, 1832. Blackwood. 8vo., pp. 484, and 605.

which it is too much the fashion to encourage in the present day, and points out the misery to which thousands have been subjected by an ill-considered and ill-provided flight, from well-known ills at home, to others that "they know not of" in the wintry wilds of the Canadas. Yet the sketch of the usual progress of a not totally destitute and industrious settler, is sufficiently encouraging:—

"Among other advantages connected with emigration to British America, the constitution of our colonies being a transcript of that of England, will be agreeable to most settlers. By the laws of England all criminal matters are judged; and, with the exception of Lower Canada, where civil causes are tried according to the *coutume de Paris*, or old French law, all matters that involve property are decided agreeably to the English laws, and those passed by the Provincial Legislatures. There are scarcely any taxes, and very few public burdens. Duties on articles of luxury are trifling; and on necessary articles there are rarely any; consequently, all that is required for supporting a family may be purchased at low rates, fine clothing excepted. I have particularly to advise new settlers against running in debt to the shopkeepers; doing so has prevented many hard-labouring men from prospering. The low price of spirituous liquors is also a great bane to the success of the emigrants; and the facility with which rum can be procured is the most prolific source of domestic misery and personal depravity that exists in America. Wherever a settlement is formed, and some progress is made in the clearing and cultivation of the soil, it begins gradually to develope the usual features of an American village. First, a saw-mill, a grist-mill, and a blacksmith's-shop, appear; then a school-house, and a place of worship; and, in a little time, the village doctor, and pedlar, with his wares, introduce themselves. Few habitations can be more rude than those of the first settlers, which are built of logs, and covered with bark or boards; but many in the United Kingdom are far less comfortable. The most that an emigrant can do in the first year is to erect his habitation, and cut down the trees on as much ground as will be sufficient to plant ten or twelve bushels of potatoes, and to sow three or four bushels of grain. If his means will allow him to carry to the land he commences on, as much provisions as will support himself and family until he raises a crop, he will *find it an object of the greatest importance, as it will enable* him to overcome the difficulties of his situation, without leaving his farm to labour for others. Much valuable time is wasted in working among the old settlers for provisions; and if the emigrant should even succeed in getting articles of food on credit, it will long be a drawback on his industry. In the course of five years, an industrious man may expect, and should have, twelve acres under cultivation, two or three cows, a few sheep and pigs, and sufficient food for himself and family. In ten years, the same man, with perseverance and frugality, ought to have from twenty-five to thirty acres under improvement—to possess a pair of horses, a waggon or cart, a sledge and cabriole, five or six cows, a yoke of oxen, sheep, hogs, poultry, &c., and a comfortable house, a good barn, and plenty of food for himself and family. This is no extravagant calculation; I could name hundreds who began in a state of abject poverty, who, in the same period, accumulated, by steady industry, fully as much as I have stated. On the other hand, I have witnessed the condition of many others, who were settled from five to fifty years in America, who scarcely possessed any of the necessaries of life; but the cause I invariably traced to their improvident character and indolent habits."—Vol. I. p. 467.

From the last paragraph it will be seen, that the causes of ill-success in England do not fail to be followed by their natural effects even in the New World,—and from the whole it may be gleaned that the settler must not expect to woo Prosperity, otherwise than by a strict devotion to hard labour and poor living in the first instance. This is a truth which cannot be too widely known: incalculable mischief has been the result of the very generally received, but egregiously ridiculous notion, that the Transatlantic land of Promise needs but to be reached to ensure plenty without labour, and riches without frugality; while the truth is, that the termination of the voyage is only the commencement of the emigrant's difficulties, and the road to independence, as well in America as elsewhere, is by a toilsome path.

Mr. M'Gregor is much more diffuse in his topographical descriptions than Col. Bouchette; and the accounts of the public institutions, state of society, manners, &c. in Quebec, Montreal, and Halifax, are especially interesting. We quote his picture of the life of the hardy

class of men employed in felling the timber of the vast forests of the Canadas and Nova Scotia :—

"The stock deemed requisite for a '*lumbering party*,' consists of axes, a cross-cut saw, cooking utensils, a cask of rum, tobacco, and pipes; a sufficient quantity of biscuit, pork, beef, fish, peas, and pearl-barley for soup, with a cask of molasses to sweeten a decoction usually made of shrubs, or the tops of the hemlock-tree, and taken as tea. Two or three yokes of oxen, with sufficient hay to feed them, are also required to haul the timber out of the woods. When thus prepared, these people proceed up the rivers, with the provisions, &c., to the place fixed on for their winter establishment, which is selected as near a stream of water as possible. They commence by clearing away a few of the surrounding trees, and building a shanty, or camp of round logs, the walls of which are seldom more than four or five feet high; the roof is covered with birch-bark, or boards. A pit is dug under the camp to preserve any thing liable to injury from the frost. The fire is either in the middle or at one end—the smoke goes out through the roof,—hay, straw, or fir branches are spread across or along the whole length of this habitation, on which they all lie down together at night to sleep, with their feet over the fire. When the fire gets low, he who first awakes or feels cold, springs up, and throws on five or six billets, and in this way they manage to have a large fire all night. One person is hired as cook, whose duty it is to have breakfast ready before daylight, at which time all the party rise, when each takes his 'morning,' or the indispensable (?) dram of raw spirits, immediately before breakfast. This meal consists of bread, or occasionally potatoes, with boiled beef, pork, or fish, and tea sweetened with molasses; dinner is usually the same, with pease-soup in place of tea,—and the supper resembles breakfast. These men are enormous eaters; and they also drink immense quantities of rum, which they scarcely ever dilute. Immediately after breakfast, they divide into three *gangs*—one of which cuts down the trees, another hews them, and the third is employed with the oxen in hauling the timber, either to one general road leading to the banks of the nearest stream, or at once to the stream itself; fallen trees, and other impediments in the way of the oxen, are cut away with an axe. The whole winter is thus spent in *unremitting* labour. The snow covers *the ground from two to three* feet, from the setting-in of winter until April; and, in the middle of fir forests, often till the middle of May. When the snow begins to dissolve in April, the rivers swell, or, according to the lumberer's phrase, the 'freshets come down!' At this time all the timber cut during winter is thrown into the water, and floated down until the river becomes sufficiently wide to make the whole into one or more rafts. The construction of the vast masses of timber floated down the St. Lawrence, and other great rivers of America, is nearly on all occasions similar. The raftsmen commence by floating twenty or more pieces of timber alongside each other, with the ends to form the fore-part of the raft brought in a line, and then bound close together by logs placed across these, and by binding one log to another with poles fastened down by withes, plugged firmly into holes bored in the logs for the purpose. The size of the raft is increased in this manner by adding pieces of timber, one after another, with their unequal lengths crossing the *joints*, until the whole lot of timber to be rafted, is joined together in one flat mass on the river. The water at this period is exceedingly cold, yet, for weeks together, the lumberers are in it from morning till night, and it is seldom less than a month and a half from the time that floating the timber down the streams commences, until the rafts are delivered to the merchants. No course of life can undermine the constitution more than that of the lumberer and raftsman. The winter, snow, and frost, although severe, are nothing to endure in comparison to the extreme coldness of the snow-water in the freshets, in which the lumberer is, day after day, wet up to the middle, and often immersed from head to foot. The very vitals are thus chilled and sapped; the intense heat of the summer sun, a transition which almost immediately follows, must further weaken and reduce the whole frame, and premature old age is the inevitable fate of the lumberer. But notwithstanding all the toils of such a pursuit, those who once adopt the life of a lumberer, prefer it to any other. They are in a great measure as independent, in their own way, as the Indians. After selling and delivering up their rafts, they pass some weeks in idle indulgence, drinking, smoking, and *dashing off* in a long coat, flashy waistcoat, and trousers, Wellington or Hessian boots, a handkerchief of many colours round the neck, a watch with a long tinsel chain, and numerous brass seals, and an *umbrella*. Before winter they return again to the woods, and resume the laborious pursuits of the pre-

ceding year. The greater number of the lumberers and raftsmen in Canada and New Brunswick, are from the United States. Many young men of steady habits in our colonies, are in the habit of joining the lumbering parties for two or three years, for the express purpose of making money; and, after saving their earnings, purchase or receive grants of lands, on which they live very comfortably, cultivating the soil, and occasionally cutting down the timber trees on their land for market."—Vol. ii., p. 209.

There are several sketches of this description in the course of the work; one of the best is, that of the progress of a new settler, the building of his log hut, &c., which we extracted from Bouchette (who took it, *verbatim et literatim*, from our author) in the notice of his book. The view of the literature of Canada is curious and striking. Literary, philosophical, and agricultural societies are established in one or other of the capitals, and several periodicals (chiefly newspapers) flourish both in English and French: while a Quarterly Review has been attempted, but failed for want of a sufficient number of readers.

The employment of the power of steam must exercise an immense influence on the future fortunes of the Western World. Mr. M'G. accordingly devotes a portion of his pages to the consideration of the subject, and avows himself a warm advocate of the plan which has been proposed for establishing a regular steam communication between England and her American colonies; a plan which will undoubtedly ere long be put in practice. In the course of these remarks, we have a valuable but brief account of the Progress of Steam Navigation on the other side of the Atlantic:—

"If we are safe in forming conclusions according to the experience of the last fifteen years, we are also safe in saying that steam is the power which will supplant all others in the magnitude and rapidity of its operations. Although we may not be quite so sanguine as Mr. M'Taggart, about making a voyage by steam from Birmingham, Manchester, and Liverpool, with a cargo of cutlery, printed cottons, &c., &c., across the Atlantic, and then up the rivers and lakes of the St. Lawrence, and over the Rocky Mountains to the Pacific and China—an undertaking *far from being impossible*—yet steam is the mighty giant that Great Britain can send forth to bring her possessions in America and the West Indies within half the distance, morally speaking, that they now are to Europe.

* * *

"A few years ago, small sloops, *bateaux* and canoes, were the only vessels that navigated the St. Lawrence between Quebec and Montreal, and British manufactures were usually from 20 to 40 per cent. higher at the latter than at the former place. At present there are eight or ten powerful steam-vessels, equal in beauty, swiftness, and magnitude, and superior in accommodations for passengers, to our steam-ships in these kingdoms, plying between Quebec and Montreal, and commodities are, in consequence, now purchased at equal prices at both places. It is not long since the ferry from Montreal to La Prairie, the usual route to the United States was crossed in a wooden canoe; passengers, horses, and carriages, are at present carried over in spacious and beautiful steam-boats. The Uttawa, and the Lakes of Canada, are also navigated by steam-vessels. A steam-ship, of about 1200 tons burden, is nearly ready to navigate the seas between Halifax and Quebec; there are two steam boats belonging to the General Mining Company at Pictou; there is another employed at Halifax; and three at St. John's, New Brunswick, one of which goes daily between that city and Fredericton; another crosses to Annapolis, from which stage-coaches run to Halifax, and a third plies between St. John's, St. Andrew's, and the United States. All this has been done in a few years; and as certainly as the population of our colonies will increase, so will also the number of vessels propelled by steam power."—Vol. i., page 424.

In conclusion, we have only to observe, that the mechanical getting-up of the book is excellent, and its octavo form much more convenient than the quarto of its predecessor; which it also exceeds in the number, variety, and usefulness of its maps. We have to regret, however, the absence of all pictorial embellishment; for we think nothing could better illustrate the text than delineations of the novel erections and appliances of the Transatlantic settler, the form and manner of which would be better understood from a tolerable picture, than from whole pages even of vivid description.

BERZELIUS, THE SWEDISH CHEMIST.

A year or two ago, English science had to deplore the loss of three of its most illustrious luminaries—Davy, Wollaston, and Young. Amid the regret which was universally excited by their death, some consolation was found in the reflection, that the phalanx of the Continental philosophers remained unbroken; but this idea can now no longer be indulged in; the same post which brought this week intelligence of the death of Goethe, the patriarch of German literature, conveyed also the unwelcome news that BERZELIUS, the eminent chemist of Sweden, and, perhaps, since the loss of the three eminent Englishmen, the first scientific character of his age—was no more. Death has, indeed, of late been busy with the great names of the earth.

Although he had begun to complain of the advances of age, Berzelius was but a year or two over fifty at the time of his decease. In his early days, he determined to qualify himself for the medical profession, for which purpose he went to the University of Upsal. At the Swedish Universities it is the custom, in addition to the lectures, to allow the students to attend and operate at the laboratory. Berzelius was so disgusted with his first two tasks in chemical manipulation, that he vowed never to ask to have another assigned him; yet, at the end of three weeks, he found himself in the habit of daily attendance at the laboratory (although the rules restricted him to a visit once a week), while his instructors were annoyed that he never asked them a single question; the truth was, he preferred taking the trouble of discovering facts for himself to hearing them from others; and to the habit thus acquired of fighting a way for himself, and of early contending with the difficulties of experimental research, may be attributed much of the high reputation to which he afterwards attained.

After leaving the University, he became assistant to Sparrman, who sailed round the world with Captain Cook; and, on his death in 1806, succeeded him as Professor of Medicine, Botany, and Chemistry, in the School of Medicine at Stockholm. He never, however, lectured on botany; and at a later period, when fresh Professors were appointed, took the *chair of Chemical Pharmacy* only. At first, his medical lectures were better attended than his chemical; but when he improved the latter by the addition of experiments (of which before they were destitute), the tables were completely turned. For the idea of this improvement, Berzelius admitted himself indebted to Dr. Marcet, of London.

When he began his labours at Upsal, the whole science of chemistry was merely a crude mass of theories, loosely banded together by a cumbrous weight of hypothesis on hypothesis. Berzelius demolished the whole, and by his exertions re-established the science on its true foundation, and gave to experiment the place of theory.

In Germany, Berzelius was better known than in England, a fact which may easily be believed, when it is known that all his works have appeared either originally, or by translation, in German; he was also not without honour in his own country. Every educated man in Sweden felt proud at the mention of his name, (except, perhaps, the Professors of the rival medical school at Upsal), and the King (Bernadotte) conferred upon him the cross of the Order of Vasa, and the grand cross of the Polar Star, besides placing at his disposal the patronage of the chemical and medical professorships of the kingdom—a privilege which he always exercised with a pure regard to the interests of science. Though a Member of the House of Peers, he preserved himself free from the contagion of party; and never suffered his scientific pursuits to be interrupted by the "heady current" of politics.

Berzelius had nothing extraordinary in his outward appearance, not wearing even the air of a hard student; and his conduct differed little from that of ordinary men, except perhaps in excessive amiability. He was troubled with the gout, and a complaint of the nature of *tic-douloureux*; but his ordinary state of health, up, at least, to a pretty recent period, was good, and gave promise of a much longer life. He himself, however, seemed to perceive the approach of decay, and, finding that both his eye-sight and his memory began to fail, he retired from the professional chair in the winter of 1830, although he continued to be Secretary to the Academy of Sciences at Stockholm, an office held, we believe,

for life. In the buildings belonging to this Institution, Berzelius had his residence and his laboratory, and it was here that he received the visits of the scientific men of Europe, with whom, and the most distinguished men of letters, he kept up a most extensive correspondence. He was a man of incessant application, being daily engaged in study and experiment for twelve or fourteen successive hours. When occupied in writing, he would sometimes not visit his laboratory for so much as six months; yet, if he came to a subject darker than usual, his instant resource was to experiment, which he would then pursue without intermission until his object was attained. For this alternate writing and experimenting, his apartments were peculiarly adapted; his desk, his furnaces, and his retorts, were all collected within the space of a few square feet.

The works of Berzelius are very numerous and valuable; and the more widely known, that they are written in several of the European languages. To the yearly report (Arsberättelse) of the Swedish Academy, on the progress of science, he always contributed the article on chemistry, which would, perhaps, have remained comparatively unknown to the great mass of students, had not the whole report been regularly translated into German. In the latter language he also contributed to many of the scientific journals, scarcely a single number of which, for many years, has failed to be enriched with a communication from his hand. To Brewster's, and some other English Cyclopædias, he was likewise a contributor; and we observe his name among those of the most eminent men of science in Europe, engaged to furnish the philosophical department of Dr. Lardner's gigantic undertaking. His principal works, however, were his treatises on chemistry and mineralogy; of the former of these a translation was recently announced at Paris, which was to receive the benefit of the revision and correction of the author. His best known work in England was perhaps his excellent Treatise on the Blow-pipe, the translation of which, by Mr. Children, has run through several editions.

GUTTERIDGE'S TORRICELLIAN STILL.

Sir,—*My last, which appeared in No. 451 of your Journal, contains* allusions to an experiment made with the Torricellian Still model at this office, on the 17th March ult. The letter below was the precursor of what then took place, and would more appropriately have preceded than followed it in your pages; but I considered it more essential to furnish the facts at once, than to wait and lose valuable time, or rather to throw it away, upon etiquette; nor should I have now transmitted it to you, did I not deem the testimony it contains of the decided superiority of the Torricellian Still, to warrant its publicity, in order to remove any doubts, which it is quite possible may have existed, as to the reality of the detailed results.

Yours, &c. W. GUTTERIDGE.

No. 30, Budge-row, London,
April 2, 1832.

"*Letter from Mr. Wm. Hill, distiller, to Mr. Wm. Gutteridge.*

"Gwynne's-place, Cambridge-heath,
"March 16, 1832.

"Sir,—I have recently called upon my friend, Mr. Saintmarc, of the Wilson-street distillery, who has shown me a sample of the spirit he made in your still. I have undertaken the management of the distillery of Mr. Wilson, Gwynne's-place, Hackney-road. The still we have is a new patent, and is the only one of the description, and also our first, as we are only now commencing. I understand from Mr. Saintmarc, that yours possesses great advantages over ours, of which he is doubtless enabled to judge from having worked the models of both; and, indeed, he does not attempt to conceal that it is also much better than that of his father's patent, which he himself uses. The spirit made by him in yours, which he has shown me, is most decidedly superior to any I have ever seen; so much so, that I wish to introduce you to Mr. Wilson, as I consider his interest and my own reputation equally require that others do not have a better still than ourselves. I look upon it to be impossible that any other should be able to compete with yours, either in purity or strength.

"Our still will yield feints like others, which I understand yours does not. This, of itself, may well account for the great purity to a considerable degree; but the power, which it appears yours possesses, is the greatest of all advantages to every distiller. Will you be so good, if convenient, as to meet me at our distillery, to-morrow morning at 10, that I may see what can be done in this business.

"I am, Sir, yours, &c.

"WM. HILL."

MR. WOOLLGAR'S NEW POCKET CALCULATING RULE.

The approbation bestowed on the new pocket calculating rule, invented by our able and esteemed correspondent, Mr. Woollgar, and first introduced to public

notice through the medium of our pages (Mech. Mag., vol. iv. p. 164) has induced the inventor to have it manufactured for sale;* and to publish, by way of companion to it, a small tract of a dozen pages, in which the mode of using the instrument, and the many valuable practical applications of which, in the hands of surveyors, accountants, actuaries, &c. it is susceptible, are briefly but clearly explained, and several very useful auxiliary tables are supplied. As originally designed, this rule was only six inches long—that is, only half the length of the ordinary twelve inch rule; but it has been since deemed expedient to increase the length to eight inches, in order to obtain space for a greater subdivision in some parts, and a more distinct demarcation in others; this, however, detracts but little from its portability, while it has enabled Mr. W. to carry the numerical graduation at least one-third farther, than even Mr. Bevan's improved edition of the common rule. The most valuable feature of this new rule, however, is the introduction of a set of scales, by which life contingencies may be calculated with greater expedition and certainty than by any set of tables whatever—a class of calculations, which though of frequent occurrence in practice, has never before, we believe, been brought under the dominion of the sliding-rule. The ingenuity and talent which Mr. W. has displayed in this part of his task are above all praise. These scales have not been graduated (as might be anticipated) according to the tables of Mr. Milne, which are generally supposed to be the most correct hitherto published, but "according to deductions made by the author, founded on a modified law of mortality which he considers to be better adapted to general calculation than the original, or than any other extant." Mr. W. has not had room in his little companion treatise to explain what the "deductions" are which have led to the adoption of this "modified law of mortality;" but we regard him as too high an authority in such matters, to entertain a doubt that he has truth on his side. We look forward, nevertheless, with no small interest to a verification from Mr. W.'s pen of this new standard of life, at some more convenient opportunity.

* *By Rooker, of Little Queen-street, High Holborn.*

NEW MATERIAL FOR HATS, LIGHTER AND MORE IMPERVIOUS TO HEAT THAN ANY YET INTRODUCED INTO GREAT BRITAIN.

Sir,—I see, in No. 50 for August, 1830, p. 414, an account from Canton of what is termed in England, "China rice paper," the produce of a plant brought, as it would appear, from the Island of Formosa, but the description of the plant is wanting. Now, I imagine, that this plant is the same, which in the Bengal provinces is called "Kookhoree, or Solah," which grows in marshes, standing in water several feet deep; the stem is some inches diameter in the lower or Bengal provinces, and is used for various ornamental and serviceable purposes, particularly for hats; and, as it appears to me that Solah hats would be in great request in England for sportsmen, I shall give you a short description, for the benefit of some honest tradesman who might profit by the manufacture; any quantity of the plant might be procured and exported from Calcutta. The natives of this country cut the solah in the way described in your Journal, that is, from circumference to centre, with a large broad knife, but without the copper plate, simply turning it round in the hand. They first make a frame of split bamboo, the size of the hat required (wire would be better); the frame is then covered with paper, pasted over it, and then the solah, about as thick as a wafer, layer over layer, till the hat be as thick as required, from half to an inch, or more.

These hats are almost impervious to the hottest sun, and as light as a feather; but as they will not bear wetting, a green oil-skin cover would be requisite. I send you a small specimen of solah, a part of the stem from which their branches shoot out at every 3 or 4 inches; it is collected about October, when the marshes dry up; the plant grows about 3 or 4 feet high, is somewhat brittle, but would be far preferable, I apprehend, to any kind of pith procurable in England. Natives of this country travelling over plains, or proceeding through forests, use this plant as tinder, igniting the end of a stick of it 1 or 2 feet long, which burns for many hours, and readily ignites from the spark of a flint and steel.

Yours, &c. B. C. S.

Allahabad, June, 1831.

[We shall be glad to show the speci-

men of the solah pith, so kindly forwarded to us by our Indian correspondent, to any "honest tradesman" who may feel disposed to turn the hint of the writer to a profitable account. We have no doubt that Solah hats would soon be all the rage.—Ed. M. M.]

PURIFICATION OF WATER—FILTRATION UPWARDS.

Sir,—From the high and intelligent stand taken by your journal in those useful subjects of scientific inquiry which concern the comforts and happiness of mankind, permit me, through your medium, to offer to your readers a few observations on the subject of filtration, as well as to draw their notice to the present means adopted to procure the mechanical or chemical separation of those animal and vegetable exuviæ which impart to many waters their noxious properties.

The saline ingredients of river water exist in too minute a proportion to be taken into consideration as affecting the dietetic properties of this fluid, and undecomposed animal or vegetable matters are probably equally innocuous; but it is to the compounds that are formed by the recombination of the elements of organised bodies, attendant phenomena upon decay, that water partakes of those qualities which render it injurious to the animal economy. Although these compounds are not included within that range of gaseous combinations which are recognised by the chemist, they yet belong to an extensive range which are readily appreciable by the rules of chemical analogy.

That there exists in nature a very numerous class of compounds formed of the elements of organised bodies, which have not been determined with any degree of preciseness, but which are yet objects of important inquiry, may be inferred from many considerations. Of this class are the matter of contagious or infectious disease; the poison of cheese, black-puddings, sausages, and many other substances, which evidently take their origin in the recombination of some of the elements of organic substances.

The precise *nature of these combinations at present cannot be determined*, nor are they appreciable by any of the tests which indicate the existence or define the combinations of matter. When we are, however, acquainted with the effects of that deadly agent, prussic acid, composed of the same elements as the muscular parts of animal bodies, only combined in different proportions, it may readily be accorded that this is one of the extreme points of the range, which includes a great and very distinctive variety of compounds, all susceptible of acting upon the animal fibre, and destructive to organic existence, and although subtle in their nature, no less pernicious in their effects.

In support of this opinion, it is a matter of interesting satisfaction that the investigations of Dr. Lambe, in his Analysis of the Thames Water, (undoubtedly the most valuable and important, although unfortunately the least appreciated of any of the publications upon that subject) satisfactorily demonstrates the existence of such a compound in that fluid, of a nature resembling cyanogen (the base of prussic acid), and, on examination, affording all the phenomena of that substance.

Here, then, we become acquainted with the existence of a compound which is sufficient to account for all the various effects of the impurities of common water, on a ground which can admit no objection from the medical enquirer, nor, making all allowance for the hyperbole of exaggeration, should it lessen our caution in providing means to ensure a remedy for the inconvenience.

It is satisfactorily conceded by the most practical inquirers that the remedy for impure water cannot be applied except in the cistern, or immediately before its use is required. The mode by which the mechanical and chemical separation of the exuviæ contained in the fluid is effected, is in the principal part of the filtering-machines now in use completely successful; but from a defect in the principle, after being a short time in use they become valueless, because the accumulation of sediment is sufficient entirely to preclude the percolation of the water. Before this takes place, through this defect in principle, on account of the accumulation of the various decomposing and noxious matters separated during the previous processes, there can be no doubt but that one of the above

extremely soluble compounds of the elements of organised bodies is found which impregnates the water with properties even more injurious than before.

I have been led to these remarks from the introduction of a filterer on a more perfect principle than any hitherto submitted to public notice, by Messrs. Walker and Willats, Strand, where the ascension of the water through the purifying strata readily admits of the machine being cleansed, before an accumulation can take place to any injurious extent. It is almost needless to add, that a filterer constructed on this principle, obviates all the defects of the former modes, and can never get out of repair.

The insertion of the above remarks in your valuable journal, if acceptable, will oblige,

Your obedient servant and
Constant reader,
A. B.

THE CARPET MANUFACTORY OF BAARN, IN HOLLAND.

(Extracted from the Letter of a Belgian Traveller to a Friend at Brussels; and translated by the latter for the Mechanics' Magazine.)

"The progress of national industry is a subject, as you, my friend, are aware, which is too near my heart, for me not to devote a part of the time I had to dispose of, during my short residence at Soestdyk (in the environs of the palace of the Prince of Orange), to visit the far-famed Royal Manufactory of Carpets, in the delightful village of Baarn, a mile and a half (English) from the palace; to which I was the more induced that I have the satisfaction to be acquainted with the Director, Mr. E. G. W. Cohen, a man of genius, and of universal knowledge.

"This manufactory presented nothing extraordinary till it became under the direction of Mr. Cohen; but since then it has attained a degree of perfection not exceeded, if equalled, by any similar establishment either at home or abroad.

"I first visited the dyeing-house, which is furnished with a great number of immense boilers, constructed after the best plans; then the place where the *colours are prepared*; and next the *laboratory, where preparatory experiments* are first made on a small scale. From these we passed to the workshop, where all the instruments and machines, from the smallest to the largest, are constructed and repaired. Such is the diversity of objects here, that, at first sight, the visitor imagines himself transported to a repository of arts and trades, or into a vast establishment composed of many workshops united. The best turning-lathes, dividing-machines, chronometers, and micrometers, engage your attention; then there is a foundry, a forge, a carpenter's shop, &c. &c. every thing, in short, necessary for constructing and keeping in order the multifarious objects used in the manufactory.

"To describe to you that manufactory itself—the carding, combing, roving, stretching, spinning, reeling, doubling, and turning-machines—were an endless task; suffice it to observe, that the machinery is all constructed according to the latest improvements, and all made on the spot, yet in such high perfection as to leave but little, if any thing, to desire.

"The products of the manufactory are of great variety. The principal descriptions are as follows:—

"Brussels carpets, with single and double ground, and threads.

"Velvet pile, or Wilton carpets, of arabesque, half superior, superior, high superior, and imperial qualities, with single as well as double ground, and threads.

"Smyrna or Turkey, and Persian carpets, of different qualities.

"Savonnerie carpets, which rival the richest embroidery or most elaborate painting in execution of figures, flowers, and designs.

"Kidderminster, Venice, jaspé, and cow-hair carpets, rugs, staircase carpets, &c.

"Of these, and other fabrics here manufactured, the warehouse in Amsterdam contains many thousand varieties, and of all qualities, so as to suit every rank—the peasant's cot as well as the nobleman's palace.

"They showed me a carpet intended for a drawing-room in the Royal palace. It would be difficult to imagine any thing more beautiful produced by human labour; the elegance of the pattern, the harmony, brilliancy, and variety of the

colours, were surely never surpassed. Another carpet, of a double ground, contained, I was told by the workman, 45 colours; and I was assured that this magnificent carpet was composed of 243,000 worsted threads, alternately united and detached from each other. This carpet was purchased by the King of the Netherlands, and sent, as a valuable present, to the King of Prussia, and it now adorns one of the finest apartments of the palace in Berlin. A third masterpiece, destined for an altar-piece in a church, representing the *Madonna de la Sedia*, of Raphael da Urbino, was a faithful copy from the beautiful and famous copper-plate engraved by Raphael Morghen. It was entirely executed in the common weaver's loom, brought to a colossal size to produce a striking effect. This piece was made in a much more ingenious manner than the Savonnerie carpets; the latter are done on a standing chain, and the colours drawn by hand—but the former was worked entirely (with 130 colours) in the common weaver's loom.

"Some of the Turkey, Persian, and Savonnerie carpets, are worked (*à haute lisse*) with a perpendicular, or standing shaft, where the colours are arranged by the hand of the workman, and immediately worked in the chain by the loom.

"One of the finest inventions used in France, in manufacturing figured silk, has been here applied with admirable effect. This invention, in utility, may compete with the cotton-spinning frames of Arkwright, with Bolton and Watt's improved steam-engine, or with Cartwright's ingenious invention of the power-loom; while, with regard to the variety and multiplicity of designs it executes, it surpasses incomparably all the old methods. And yet it is but a simple machine, having neither wheels nor screws.

"It is known, that in order to produce the figure in any weaving, the threads must be successively drawn in a certain order till finished; and it is this which has given rise to the operation called drawing, which consists in pulling up, after each throw of the shuttle, in a prescribed order, one of the threads necessary in the formation of the figure; an operation usually done by apprentice-boys. With *the machine which I* have just mentioned, all the inconveniences of the drawing not only by hand are avoided, but many other advantages are obtained, which gives the highest perfection to this art, and such as it never could have reached by the old method.

"An establishment of so much importance was worthy the patronage of the Government, and it has accordingly honoured it with its special protection. The Director, who is a Member of different Royal Societies of Arts and Sciences, obtained at the exhibition of Ghent, in Flanders, in 1820, the silver medal. At the last exhibition at Haarlem, in 1825, he also received the silver medal; besides various medals for several inventions and improvements in the manufacturing of cards for wool and cotton. The Royal Society of Haarlem for Domestic Economy, assigned to the Director of this fine establishment of national industry, its medal of honour; and at the exhibitions both of Ghent and Haarlem, the King purchased many of the principal specimens produced by the manufactory."

CORRUPTIONS OF THE ENGLISH TONGUE.

Sir,—A great deal has undoubtedly been done in the present century towards the great object of rendering knowledge universal; yet not near so much as might have been effected. True, Literary Institutions and Mechanics' Institutions have multiplied on every hand, and some disposition has been evinced, on the part of the hitherto monopolists of information, to throw open the gates of the Temple of Science much more widely than before; but the time, it is to be hoped, is coming when literary monopoly of any sort shall be unheard of, and the gates of that temple thrown open *to all comers*, without exception. As matters stand, all are welcomed, but most soon find a stumbling-block in their path. "*Hard words*," the proverb tells us, "break no bones;" but they do, perhaps, more extensive mischief. They too often operate as an effectual bar to the progress of the uneducated student. The fondness for them displayed by our would-be popular writers and lecturers, is doubtless a chief cause of that decline in the enthusiasm of the working classes in the pursuit of knowledge, which has already produced the discontinuance

of most of the institutions for their instruction around the metropolis.* What can be expected, indeed, when men of little education are invited to acquire information by the reading of books, and the hearing of lectures, in a language they do not understand? The invitation appears as mere a mockery as the invisible supper of the Barmecide; and it is no wonder that, after a few months' ineffectual effort to comprehend what he reads and hears, the labourer should decline the task in disgust—leave off his subscription—and return to his old habits of spending his leisure at the public-house, with the reflection, that either it is impossible, in the nature of things, for a man in his sphere to acquire any scientific knowledge, or that those who pretended to wish for his instruction took care to prevent his obtaining it, by clothing their lessons in unintelligible and mysterious gibberish.

It is a question far more easily asked than answered, Why should the English language not be the language of science? The present method of dragging in technical terms from any rather than our own mother-tongue — Greek, Latin, French, Italian, German, &c. &c. &c. — would seem to be merely a weak invention of the now exclusive possessors of knowledge to keep out "the generality." They surround their field with a quagmire, and then invite every one to enter, well aware that none can do so, unless mounted upon stilts. These quagmires must be filled up. Why do they wish to exclude? Not because the field is not large enough, but simply because more vigorous cultivators would rush in, and eclipse the present race. Why then do they invite entrance? Merely that their conduct may *appear* liberal! The system, however, is continually in danger of being overthrown; one vigorous and continued effort might do it: those who make that effort will be no slight benefactors of their kind.

When the Society for the Diffusion of Useful Knowledge was set up, it was expected that much would be done in the way of making "useful knowledge" accessible to all; but these expectations have been any thing but realized. The treatises they have published have been crammed full of technical expressions and long words from the Greek and Latin, totally unintelligible to the mechanic and the labourer. The consequence is, that the mechanic and the labourer are just where they were,—obliged, notwithstanding the Lord Chancellor's anathema in his introductory discourse, to resort to the newspaper for instruction and amusement; that when they *do* read, they may understand what they read. A series of well-arranged and plainly-written treatises, *entirely in the English language*, would, by this time, have effected a most extensive alteration. The imperfect and obscure ones which have appeared have done—nothing!

What encouragement is there to the study of chemistry, when the student is met at the entrance by a "chemical *nomenclature?*" This may be of some advantage to those versed in Greek and Latin; but what an immense obstacle is it to the labouring man, who has been taught only reading, writing, and arithmetic. If we must have a "nomenclature," why not found it upon the language spoken by all? Why are substances known to all by their common names, to be so disguised in their scientific character, as to be known only to the privileged few? If every thing in chemistry were made as plain as might be, would not the science make a more rapid progress than has ever yet been known? "Full many a flower is borne to blush unseen;" and, doubtless, full many a Davy has passed through existence unnoticed and unknown, whose discoveries would have immortalized his name, if chemistry had not been wrapt up in its forbidding "nomenclature."

But the state of many of the other sciences is much worse than this: their very names are hidden in mystery. Why is the science relating to insects called entomology—that relating to birds, ornithology — to animals, zoology — to the structure of the earth, geology? If we are to have the eternal ology, why should not these words, at any rate, be changed to insectology, birdology, animalology, earthology? Barbarous as these may seem to the eye of the refined, they would have one requisite which the present words do not possess—that of being intelligible at first sight.

* See the speech of Dr. Mitchell, at the late Deptford Meeting, in the Mechanics' Magazine for Jan. 14.

Our entomologists are heinous offenders. They divide insects into classes, according to the structure of their wings; but, for instance, instead of calling those which have scaly wings the "scale-winged class," they call them by the fine name of "lepidoptera," derived from two Greek words, signifying—what?—*scale-winged!* And thus they go through the whole. Can any thing be more madly absurd? Yet the ornithologists are scarcely, if at all, better: some of these gentlemen have introduced a "*quinary* system," *i. e.* a system of arrangement by fives, in which the various kinds are distinguished by their Latin names only. Birds of prey are, *raptores*—perching birds are *insessores*—swimming birds, *natatores*—and so on, to the end of the chapter.

We have a poem, too, called "Ornithologia," in which the author displays his deplorable want of poetical feeling in a most conspicuous manner, by actually rejecting the common and, in many instances, highly poetical English names of the birds he celebrates, and weaving into his rhymes, with unwearied labour, the long, harsh, uncouth, and unpoetical Latin ones! Such instances of outrageous bad taste are fortunately rare in poetry; and, ere long, plain prose, it is to hoped, will be freed from the nuisance.

Farming has long been undergoing a change into *agriculture*, and farmers into *agriculturalists*. The gardeners have caught the infection, and their 'profession' is now nothing less than that of horticulture. This folly, it is to be hoped, will not spread any farther, although taken under the patronage of Mr. Loudon, the editor of (wonderful to relate!) the *Gardeners'* Magazine, who, as if not satisfied with the already rapid march of unintelligibility, is every now and then doing his best to accelerate its progress. Thus he cannot think of telling his readers how to plant trees,—he must give them instructions in *arboriculture;* if they wish to know the manner of growing tulips, they must turn to *floriculture:* nay more, his ears are continually offended by the sound of the word land-steward or bailiff, which he considers perfectly barbarous, and would forthwith replace by the elegant, the appropriate, the expressive term of *agronome!* Yet Mr. L. is a liberal, and a friend to universal knowledge.

The language of geology is altogether a mass of confusion,—Latin, German, French, and English mashed into a meaningless heap. We hear of "argillaceous earth covering a stratum of quartz, intermixed with feldspar and plum-pudding stone, indicative of the *debris* of a former world." Who can help turning away from such gibberish as this in disgust?

Even to learn how to play the fiddle properly, requires the acquisition of a language, and that too a totally different one from those which will serve the chemist, the entomologist, or the geologist. It would be considered sacrilege if the performer were to be told to play "not too fast" in any other tongue than "choice Italian;" let him, therefore, discover the meaning of the magic words "*non troppo presto*," or resign his task. It would spoil a piece of music to interline it with directions to play "with expression," or "livelily;" while it dignifies the page to intersperse it with "con expressiones," and "allegros!" This absurdity admits of a very easy remedy, which ought to be applied without hesitation, — simply the translation of the terms.

It is to be regretted that the working classes themselves have been dazzled with the brilliancy of Latinized English, as, by their aiding in its adoption, they are unwittingly retarding the progress of their own freedom. How ridiculous is it to see an address, instead of coming, as used to be the case, from the working men of London, "emanating" from the "operative mechanics* of the metropolis:" how wretched to hear one call himself "an operative!" While this miserable hankering after long unmeaning names continues, it will be more than ever difficult to effect the release of its votaries from that slavery to phraseology by which they are bound down.

It is a common observation with the apologists for this monstrous abuse, that education is now so widely spread, that the present generation can perfectly understand language which was unintelligible to their forefathers. This may be true; but might not the time which has been occupied in teaching the meaning of these hard *words* have been employed to much better advantage in teaching the nature of *things?* Will it not take more

* The word mechanic has got into such general use, and is so necessary a term, that it cannot be objected to, although it would be better if spelt without the h.

time and trouble to learn Latin (or Latinized English, which is worse) and zoology, for instance, than to learn zoology by the aid of no other tongue than plain English? Might not a boy learn to scrape a tune or two on the fiddle, sooner than the tune or two and the Italian to boot? Besides, new hard words are continually being introduced, and thus the general world is always kept in the rear of the scientific. Many phrases which are now unintelligible to the common reader, may be pretty generally known to the next generation; but by that time a new supply of unintelligible phrases will have been introduced; and thus the common reader of that day, like the common reader of this, will be inevitably kept in a state of half-knowledge. This is a reason why the introduction of any new foreign words, not absolutely necessary, should be decidedly discountenanced by every one who may have any influence on the literature of the day.

Trusting that the insertion of these few desultory remarks, in so widely-spread a journal as the Mechanics' Magazine, may not be without some little effect in repressing an evil whose magnitude has hitherto been regularly increasing, and certainly ought to be diminished,

I remain, Sir,
Yours, &c. F. H.

Jan. 20, 1832.

NORTH LONDON LITERARY AND SCIENTIFIC INSTITUTION.

At a public meeting held on Wednesday evening last, at the Clerkenwell Parochial School Rooms, E. L. Bulwer, Esq., M. P., in the chair, it was resolved to establish an Institution, under the above title, for the promotion of "philosophical investigation and scientific research." It was originally proposed, that the institution should be called the North London Literary and *Mechanics'* Institution;" but in consequence of a plausible, but mendacious, speech obtruded on the meeting, by our Ex-Fag Hodgskin, of jackdaw memory, the word "Scientific" was substituted for "Mechanics." We are informed that, by way of illustrating the propriety of his amendment, Mr. H. said, that when Assistant-Editor of the Mechanics' Magazine, he had found that the word *"mechanics"* was a great obstacle to its *circulation among the better classes*, from its suggesting the notion that it was a work designed only for mechanics. The lying varlet! The Mechanics' Magazine never knew an obstacle of the kind; it has never experienced aught but the readiest acceptance among all classes, from the highest to the lowest. It started almost instantaneously into a more extensive circulation than was ever before obtained by any scientific journal in this country; and still numbers more readers than all the other scientific journals put together. We have no means of knowing positively by which class of the community we are favoured most; but there is an impression on our minds, produced by a variety of concurring circumstances, that it circulates most among those very classes who, according to our veracious Ex-Fag, should incline to it least. However, it is rather this particular illustration, than the amendment itself, that offendeth us; we think the title adopted for the new Institution much more appropriate than the one originally proposed: and seeing nothing in the plan of the Institution to prevent mechanics availing themselves of the benefits it will offer, but, on the contrary, many strong tempations to induce them to become members—a reading-room, a library, lectures on the sciences and mechanical arts, &c., all for the small sum of twelve shillings per annum—we wish it every possible success.

Steaming Extraordinary.—H. M. packet, Dolphin, Captain Smithett, arrived in Kingstown Harbour yesterday morning, having made the passage from Liverpool in less than twelve hours. Taking into consideration the disadvantages of a heavy sea and a strong head-wind, with which she had to contend during the night, this will be allowed to be perhaps the most expeditious passage ever made between this port and Liverpool.—*Dublin Journal, March* 23.

INTERIM NOTICES.

The Supplement to Vol. XVI. with a Portrait Engraved on Steel, of Baron Dupin, the Founder of Mechanics' Institutions in France, will be ready on the 1st of May.

Communications received from S. Y.—Mr. Tidmarsh—E. J. Erickson—P. P. P.—R. A.—An Old Member—Scientificus—Mr. Hyde—C. W.—J. H.

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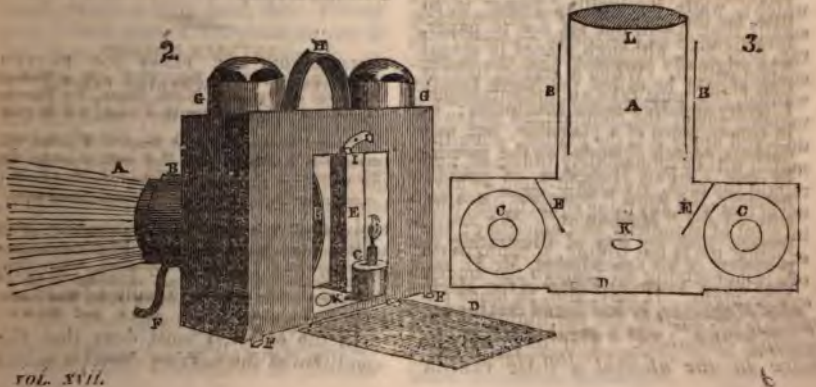
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No 453.] SATURDAY, APRIL 14, 1832. [Price 3d

POTTER'S POLYCHREST LAMP.

ENDLESS MAGIC LAMP



POTTER'S POLYCHREST LAMP.

It was Sir Humphry Davy, we believe, who several years ago made the discovery, that if a coil of platina wire were inserted in the wick of a spirit-lamp, and once made red-hot, the flame might be blown out, and yet the wire remain ignited for a great length of time afterwards—as long, indeed, as there remained any spirit in the lamp to feed the ignition. A platina coil was thus kept burning constantly for a fortnight at a time; indeed, so slow was the consumption of the alcohol, that it seemed possible with a reservoir, of no great magnitude, to keep the platina ignited for years. A very useful application of this interesting discovery has been recently made by Mr. Potter, of Old Compton-street, Soho, in the Polychrest Lamp, of which there is an engraving on the preceding page. It consists entirely of glass, and makes a very handsome drawing-room or boudoir ornament. The spirit is contained in the globular reservoir A; and the cotton wick (*c*) in the central glass tube, *d*. The coil of platina (*a*) is bent at the lower end into a straight, pin-like form, that it may be inserted into the centre of the wick, without bringing the coiled part in contact—a precaution which it is very necessary to observe. B is a glass cap, which is taken off when the lamp is in use; were a few orifices made in it to admit the air, this removal would be unnecessary. The wick is lighted in the usual manner by a piece of paper, and as soon as the platina coil becomes red-hot, which is always in the space of a few seconds, the flame is blown out. So luminous does the platina remain, that you can tell the hours by it on the dial-plate of a watch; while its igniting power is so small, that it will not set fire to paper, rag, tow, &c., although placed in actual contact with it. When a greater light is wanted, you must take an instantaneous-match—one of the common red sort will do—and apply it to the platina, when the match will be immediately inflamed, and relight the wick. As a night-lamp we have never met with any thing equal to this, both in point of simplicity and efficiency; the expence too is but trifling, a pennyworth of alcohol serving all through the longest winter night. It may, also, be made extremely serviceable for perfuming or fumigating chambers. You have only to dissolve in the alcohol a little vanilla camphor, or other odoriferous or disinfecting substance; and you will have speedily diffused through the room the peculiar fragrance of the article employed.

ENDLESS MAGIC LAMP.

Sir,—Seeing with pleasure the prompt insertion you give in your valuable Magazine to every useful suggestion which may possibly tend to encourage and promote a love of scientific pursuits in the humbler classes of the community, I am emboldened to send you a scheme of mine which I put in practice a few years ago. It is a Magic Lantern of endless variety, in which I can substitute any common drawing or print for the transparent figures painted on glass; or a small animal, the human face, &c. &c. may be correctly shown on a screen by it. Probably some of your numerous readers may improve upon the plan.

I am, Sir, your constant reader,

MILES MADDER.

Description of the Engravings.—(Figs. 2 and 3 front page.)

A represents the sliding tube containing the lens. B the fixed tube into which A slides. C the lamps or candles. D the door (shown open) against the inside of which the print or drawing is put. E shades set up in the inside of the lantern, to prevent the light from being thrown upon or towards the lens. F the feet of the lantern. G smoke draughts above the lamps. H the handle to carry it by. I the door latch. K a hole to admit air to the lamps. L the lens (mine is 8 inches focus.)

REMARKS ON THE PLANS FOR BETTER HOUSING THE WORKING CLASSES.

Sir,—After an attentive, and, I hope impartial consideration of the plan proposed in No. 434, for the better housing the working classes, I feel myself obliged to express an opinion unfavourable to it, and not only to that plan, but to all others which may have the congregating together in one building so many as one, two, or three hundred families for its object.

In the outset, I must deny that the condition of the working classes is so bad

as may be inferred from the partial description given by Junius Redivivus. He has drawn a lugubrious picture, but he has chosen his portrait from among the improvident and careless; were it necessary I could furnish a perfect contrast. In order, however, to prevent any mistake as to the sentiments I entertain towards the lower classes, I must observe, once for all, that I applaud the motive which has prompted your correspondent to broach the subject, and could any plan (excepting one founded on a barrack system) be devised for improving their domestic comforts, my best endeavours should be exerted to promote it.

For the present, I think we must be content to inculcate the advantage of habits of cleanliness, honesty, and self-dependence; and if I am not much mistaken, we shall, by so doing, advance a great way towards improving the respectability and comfort of all classes. That the plan of Junius Redivivus would have a tendency to supersede the principle of self dependence must, I think, be very perceptible. Witness the contrivances for warming and lighting the building, and even providing victuals ready cooked to be purveyed at a certain price, or kitchens with fires and boiling water, ready for the use of such as might choose to use them. Indeed, it would not be matter of choice whether they should use them or not; for if the apartments are to be heated by hot air or steam, the occupants must, of necessity, resort to the public kitchen for culinary purposes. There are few lodgers, however, who would like to take the trouble of running to the public kitchen every time they wanted to cook a potato or steak, toast a piece of bread, warm a little beer, &c. For my part, I look upon a fire-place as one of the most indispensable things in an apartment; it causes a draught through it, and contributes much to its airiness and salubrity. Indeed I do not see how, in such an extensive building as that proposed by J. R. or Mr. Loudon, with hundreds of rooms occupied by all sorts of people, it would be possible to provide for a thorough ventilation. There might be a rule laid down, that every occupant should have his particular window or windows open a certain time every morning and evening; but could *such a rule* be enforced? *It would be impossible: yet many such observances to provide* against dirtiness and impurity of the atmosphere would be required, to which the lodgers would not submit, unless they were placed under as strict a surveillance as is exercised in hospitals and barracks.

A college in which every one should be left to the freedom of his own will, would be a complete Babel, without having one redeeming point, beyond that of the saving of a few shillings a week. What a scene would the laundry, &c. present on washing days, and the kitchen on every day! Fancy one hundred females in each of the four kitchens, each with her modicum of meat and vegetables, stewing, roasting, and boiling. Surely a more impracticable plan never was proposed. The occupations, tastes, and habits of any number of working people brought indiscriminately together, must be so various, so jarring, and clashing, that without a large and unfailing supply of the oil of good temper and patience, the machine would never work smoothly.

Considerable stress is laid on the good that would be done by means of the force of example; but example only is a weak instrument to work with, unless there is an agent whereby to enforce the precepts exemplified. If the sight of virtue alone were all-sufficient, how is it that the virtuous portion of the poorer classes do not now reform the vicious—for I am prepared to maintain, that the poor relatively are as virtuous as the rich? Experience proves, that vice operates far more powerfully by the force of example than virtue. To expect a reformation, therefore, in this way, is like attempting to build a castle on a quicksand.

Another of the anticipated advantages is the establishment of schools and reading rooms for males and females. Surely this is not a proposition put forward in serious earnest; J. R. must have made a slip with his pen, or he is laughing at us. Of what advantage would it be to labouring men's wives to have a literary club? Is it necessary, or would it be prudent? Every woman, whether high or low, has plenty to attend to in her domestic duties, without running about to hear lectures; and every father of a family would be much better employed in looking after his children at home than in resorting to a news-room. The best way to reform and make happy the poor, is to increase their domestic comforts. Much better

than any news or reading room would be the establishment of parochial libraries—a plan I hope to see very shortly carried into effect. Besides, infant schools, and schools for children without expense to the parents, exist already almost everywhere.

J. R. taking his data from the Pantechnicon, calculates, that for two rooms, each of 15 feet square, the rent would be six shillings per week, including warming. But such a building as a working man's college, would cost far more in the erection than the Pantechnicon. The doors, sashes, partitions, &c. would amount to something more considerable than the difference saved in weight; the very workmanship would far outvalue that saving. Then there would be the public burdens—poor's rates, paving rates, assessed taxes, and a frightfully long *et cetera*. It seems to me, that it would be impossible to afford two rooms, such as he speaks of, for six shillings.

But, supposing J. R. were right in his calculations, the question comes still to this: Which is it best for a working man to do—to live in a barrack, under a sort of barrack discipline, for the sake of a cheap rent, or to pay a larger rent, and be free from all controul? I think there can be little doubt, how the labouring poor generally would be disposed to solve such a question.

Manufacturers are too well acquainted, I apprehend, with the power of their workmen, to be tempted by Mr. Loudon's advice, to enter on any speculation of the kind. It would involve them in endless bickerings and disputes. For the sake of the poor, I should be sorry to see the masters combine for any such purpose; it would only be founding a truck system for lodgings. No, Sir, the best plan is to let men seek out their own places of abode; and in this large city, with its extensive suburbs, there is no want of good, cheap, and healthy lodgings for the poor. The city, even built as it is, is by no means unhealthy; the lanes and alleys are as open as Junius R.'s building would be, and, with this advantage, that there are constant currents of air, of which every one may take advantage if they will, by opening their windows. The chief cause of the unhealthiness of the more confined parts of the city *lies in the dirty habits of the poor*, and *the inattention of their landlords* to many little conveniences, which it would cost but little to supply, but which, partly from sordidness, and partly from the uncertain nature of their returns, they leave undone. Junius R. must not go to Petticoat and Rosemary-lanes, Duke's-place, St. Giles's, Whitecross-street, and similar places, to judge of the habitations of decent mechanics. I can safely say, that he will not find many *honest* and *thriving* men in such dens of misery. Persons of that stamp can pick out clean and cheap rooms in numerous other situations. Be it observed, nevertheless, that I am far from maintaining that the residences of working men may not be much improved. I do not feel myself competent to show how this may be best done; but it has occurred to me, that an association for the purpose of buying or renting houses, putting them in fair condition, and letting them out to the mechanic at such a rate as will just yield simple interest on the capital invested, might be established and carried on as successfully as other charitable trading concerns. I do know a benevolent individual, who has two houses which are let on this plan. As yet he has been nothing out of pocket, and has only the trouble of gathering the rents weekly. The houses are old and in a confined situation; but by a timely attention to cleaning, and to all needful repairs, they are rendered very comfortable residences. Let others go and do likewise, and our streets and lanes would speedily present a cleaner, more cheerful, and happier aspect.

Yours, &c. T. M. B.

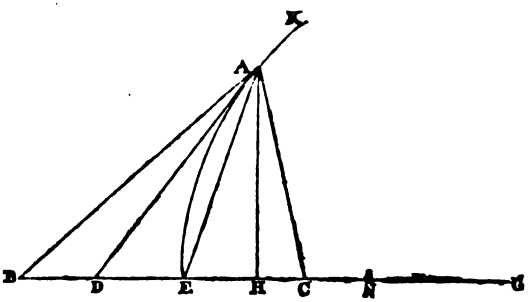
March 22, 1832.

P. S.—T.'s scheme of roadside houses is picturesque, useful, and benevolent; I should like much to see it realized.

SOLUTION OF THE FIRST MATHEMATICAL QUESTION, VOL. XVI., P. 187.

By Kinclaven.

Question.—Given the base and a point in the base of a plane triangle: it is required to construct it so that the sides may have a given unequal ratio to one another. Also, that the rectangle contained by the sides shall be equal to the square of the straight line drawn from the given point in the base to the opposite angle of the triangle.



Analysis.

Let D be the given point in the base, and suppose ABC is the required triangle. Divide BC in E in the given unequal ratio of their sides. Then will the locus of the point A be in a given circle, whose centre is in BC produced, and the circumference of which will pass through the point E (Prop. F, Book 6, Playfair's Euclid.) Let EAK be the circle. Join AE, and draw AH perpendicular to BC. Then, because BE:EC ::AB:AC,∴AE bisects the angle BAC ∴AB·AC=BE·EC+AE². But AB·AC =AD² by hypothesis; hence BE·EC+ AE²=AD²=AH²+DH², and AE²=AH² +EH².∴BE·EC=EH²=DH²=DE²+ EH²+2DE·EH, or BE·EC=DE²+ 2DE·EH=DE (DE+2EH); consequently, DE:BE::EC:DE+2EH.∴ DE+2EH is given. But DE is given; hence 2EH, and ∴EH is given: hence the point A and ∴ the triangle ABC is given.

Composition.

Divide BC in E in the given unequal ratio of the sides; to DE, BE and EC find a fourth proportional DN; bisect EN in H; and draw HA perpendicular to BC. Produce BC to G, so that BG GC=GE², and from the centre G and distance GE, describe the circle EAK cutting HA in A. Join AB, AC. Then shall ABC be the triangle required.

Because BG·GC=GE².∴AB:AC :: BE:EC (Prop. F, 6 Elem.) and AE bisects the angle BAC.∴AB·AC=BE· EC+AE²=BE·EC+AH²+EH². But by construction, BE·EC=DE²+2DE· EH.∴AB·AC=AH²+DE²+EH²+2D +2DE·EH=AH²+DH²=AD².

Scholium. The above problem is confined to certain limits. If the ratio of the sides be that of equality, the problem will be impossible. For thus BE=EC, and AB=AC. In this case, the locus of the point A will be a straight line drawn from E at right angles to BC. Then AD will always be less than AB or AC.∴ AB·AC will be greater than AD². Again, although the sides have an unequal ratio, still the given point D must be in the greater segment BE. For, since BE·EC+EH²=DH², wherefore DH²>EH², or DH>EH, that is D must be situated between B and E.

KINCLAVEN.

[Solutions also received from Mr. P. Ellis and C. Q.]

BOAT-PROPELLING EXPERIMENT.

Sir,—I made an experiment to propel a boat by means of propellers working on axles on each of its sides; they had joints in them, and on their being pressed forwards gave way, which prevented the opposition of back water, and there was canvass so nailed and sewed, that it worked on the principle of the web foot of amphibious animals. Besides the whole of the work was placed on a *balance*, so that it might *be raised or lowered, to* prevent power being lost from the opposition of back water. The boat was so narrow, that by means of two iron rods and a rod across, I was enabled to draw both boards at once, which propelled the boat with considerable velocity. The propellers worked in about nine inches water, and in little back water, for the reason above mentioned. I should be glad to know from some of your scientific correspondents, whether a greater force might not be employed in this way than by oars?

The tow-boats of the Bristol and other rivers, are, it is likely, similar now to what they were centuries ago—nay, even in the time of the Romans; the oar, then, is the most primitive of tools; there must, therefore, I think, be room for improvement. Possibly the pendulum would not be inapplicable for such a purpose. I beg to take this opportunity of thanking the Bristol Steam Packet Dock Co. for the readiness with which leave was granted me, through their agent, to make the above experiment in their Dock-yard.

C. W.

STEAM-VESSEL CONTEST—BUSK, KEENE, AND CO.'S NEW BOILER.

Sir,—Happening to be at Richmond upon Sunday last, I was much entertained by a contest which took place betwixt two steamers upon their return to London; and as the subject seems a good deal connected with the progress of science, I think the matter cannot be without interest both to you and many of your readers. One boat was the Diana, long well known upon that station, provided with a 20 horse power engine by Bolton and Watt; and the other a new and much smaller boat, the Queen Adelaide, having only a 12 horse power, upon the patent principle of Busk, Keene, and Co., of Bankside. The Diana was to have started at five o'clock, the Queen Adelaide at half-past. The Diana, however, did not depart until very nearly the half hour. This much annoyed the little boat, and her people I found, upon embarking in her, were set upon having their revenge, by subjecting their antagonist, if practicable, to the mortification of being left in the rear on their voyage down. Every due preparation was accordingly made for effecting that object; and after waiting for passengers about a quarter of an hour, the Queen Adelaide set forth, making 44 strokes of the engine, and the like number of revolutions of the paddle-wheels, per minute.—Keeping on steadily at the like rate, we before long viewed the chase at a distance, and found that we were gaining upon her considerably. Shortly before reaching Hammersmith Bridge we neared her close, and, after some adroit manœuvring upon the part of the steersmen, upon *both sides*, we passed her in good style, *and then steadily maintaining* our course, we continued to gain more and more until we arrived at our destination, off Blackfriars' Bridge, in 2 hours and 20 minutes from leaving Richmond; we had a strong head-wind to contend against the whole way, and the tide also all the way from Kew Bridge.

The gratifying success of the little boat can only be attributed to the advantages derived from the peculiarities of her engine. I am not aware that these engines are as yet either much known in this country (although I understand that several of the same kind have been for some time at work in France), or that they have been before noticed in your publication. The engines may be said to be of the locomotive class; their leading advantages—great lightness in proportion to power, and rapid and well-sustained generation of steam, and using that steam under considerable pressure, and all that coupled with the highest—perhaps with perfect—security against danger from explosion. The boiler consists of two or three rows of horizontal tubes, placed gridiron-fashion, each tube being about 2 inches in diameter, and all are united at each end in a small chamber or receiver, whence the steam passes into another small upright vessel called the separator, from whence the cylinders are supplied. The fire is made in a small furnace under the tubes. The water in the boiler is contained in the tubes; and the external surface of the tubes is exposed immediately to the action of the fire. This differs from the arrangement in Mr. Stephenson's locomotive-engine boiler, which is also called a tube-boiler; there the water is contained in a large, and thence a more or less dangerous vessel, whilst the tubes are passed through this vessel, and its water, and the fire, and draft, again through these tubes. The quantity of water in the Busk, Keene, and Co. boiler is very small; it is probably not more than 1-10th of the quantity usually contained in other boilers of the like horse power. All parts of the boiler being of small diameter, can be readily made of much greater strength than can be needful; and from each part being small, and the quantity of water being also small, were any part ruptured purposely, or by accident, when all is in full work, the discharge of either steam or water would be far too trifling to occasion any mischief whatever. The perfection

of safety seems to be obtained when explosion can do no damage. The whole is made of wrought-iron; and every part is so arranged as to admit of being readily cleaned. The engine cylinders oscillate, are supported in vertical frames, and work direct upon the crank of the paddle-wheel and shafts without any beam; this makes them occupy very little space. The cylinders in the Adelaide are about 7 inches in diameter, with 1·9 ft. stroke, and have patent metallic conical pistons. They work expansively to a large extent, and the steam after coming out of the cylinders is condensed in a nest of small copper tubes by the exterior application of cold water, and afterwards returned into the boiler, and heated in its road thither without expense, by passing through a copper coil, placed in the head of the condenser, and there exposed to the action of the steam in its exit from the cylinders; thus affording a constant supply of distilled, and therefore pure water. The engines, the frames, and boiler, with its water, the paddle-wheels, and chimney, are stated altogether not to weigh more than about 5 tons.

At a period when improvements in steam are so much looked after, and seem so peculiarly needed, at least for inland navigation as at present, these engines can hardly fail before long to be brought into general use.

Yours, &c. P. FAIRPLAY.

London, April 10, 1832.

MR. AUDUBON.

Sir,—I regret that I have only just seen your Number for the 10th of March last, for it contains a paragraph respecting Mr. Audubon, the American naturalist, which calls for your immediate explanation; and which, I am sure, on reflection, you will regret that you have printed.

That you should quote, *without dates*, such an attack on the veracity of a man of deserved eminence, merely on the strength of your *never having seen any refutation*, is, I must say, in the Editor of a work like yours, very unjust and inconsiderate.

But, from all I have seen of your conduct of your Magazine, I feel sure, when you hear the following facts, of which I challenge the *fullest investigation*, you will be the first to feel regret for these false accusations, and to make most ample atonement.

Mr. Audubon, after a life passed in the American forests, brought to England the fruit of his labours, to publish in England a work on ornithology, confessedly unparalleled. His merits have been acknowledged by *all* our eminent naturalists here—and this fact alone ought to have made you pause before repeating such a calumny. As is well known, he is the *first* naturalist who has painted and described birds literally *from the life*—the natural size. It is needless to say, that *all* who know him (as I have the pleasure of doing), know that a more simple-minded, honourable man, is not living, nor one farther from any deviation from truth. His Biography of Birds (one volume of which is published), is received by all who are judges, as the most valuable, perhaps the only work of the kind. Attacks, similar to the one you mention, were made some time since upon him by envious parties in Philadelphia; but they were speedily put down, as you would have found had your search been as accurate as it ought to have been.

Audubon is now in America, or he would have answered you himself; he has just been received (by letters I recently have from him), in the most distinguished manner at Philadelphia—the very seat of these refuted calumnies. The Americans are, as they have good reason to be, proud of their distinguished country. Meanwhile his grand work—the labour of a life—is going on; and will be the most magnificent thing ever published. If you have never seen these plates, I am sure Mr. Havell, the engraver, will show you some specimens; and then you will be even more anxious than I trust you now are to do him speedy justice. He is on the frontier of the Floridas, adding to his unrivalled collection; and you will fancy with what feelings, on his return, he would meet such an attack, in a land where he has hitherto found only honour and kindness.

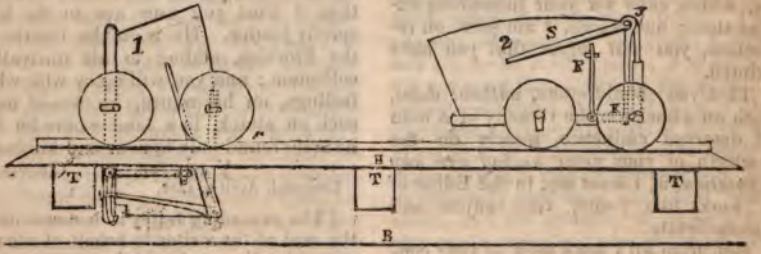
Yours, &c. QUIVIS.

Liverpool, April 2, 1832.

[The preceding letter is honourable to the zeal of the writer in behalf of his absent friend; we should have been very glad had it been also so satisfactory, as to leave us no other course but to make the *amende honorable*, which he expects at

our hands. But on what grounds does he accuse us of being "unjust and inconsiderate"—does he call upon us "to make most ample atonement?" He says, that "attacks similar to the one" mentioned by us, "were made some time since upon him (Audubon) by envious parties in Philadelphia," but "were speedily put down," as we might have found out had our search "been as accurate as it ought to have been." How "*similar*" attacks may have been disposed of is, however, little to the purpose; the question still remains—Has the particular charge which we copied into our pages ever been refuted? "Quivis" does not venture to say it has. It was a charge of want of veracity, brought against Mr. Audubon in the broadest and most unqualified terms, by Dr. Jones, the respectable Editor of the Franklin Journal, and Superintendent of the Patent Office at Washington, as far back as August, 1828. We receive the Franklin Journal regularly, and have never, in the course of the years that have since elapsed, seen in it any retractation of that charge, or any attempt on the part of Mr. Audubon to refute it (though a considerable time has elapsed since he returned to America). Are we not entitled, therefore, to conclude that Dr. Jones, at least, has seen no cause to change his opinion of Mr. Audubon? And is it not a sufficient justification of our conduct in republishing the unrefuted and unretracted charge in question, that it is of a nature, if true, to destroy entirely Mr. A.'s authority as a naturalist? The particular production to which Dr. Jones's charge had reference was a paper on the rattlesnake, which was read before the Wernerian Natural History Society (we presume the Edinburgh Society of that name), on the 24th of February, 1827; and even to us, who are not of a rattlesnake country, it does appear to contain abundant intrinsic evidence of having been the fruit of invention rather than memory. Among several marvellous stories which it relates of the animal, as having come under the author's own observation, is one of a rattlesnake living in a cage for the space of *three* years (not in a dormant state, be it observed, but all alive and kicking) *without any food whatever!* It would not even touch food when thrust before it!!! We are not unacquainted with the work on birds by Mr. Audubon, to which his friend refers us; we admire very much the splendid style in which it has been produced; but we have yet to learn how the distinctive characteristics of a bird can be better known from a picture the size of life than from one on any smaller scale, and how painting an animal the size of life can be any evidence of the truth of whatever stories the painter may choose to tell respecting it. Every year's exhibition at Somerset House furnishes abundant proofs that painting life sizes, and painting to the life, are two very different things. Our honest opinion is, that the scientific circles of this country have been very considerably duped by Mr. Audubon; nor is this opinion at all shaken by the marks of respect which he is said to have received at the hands of his countrymen, since his return with the feather we have stuck in his cap. All nations, collectively considered, are but too much disposed to take upon trust, what other nations say to their honour and glory. The number of those who love truth still more than country is nowhere great; but the dissent of even one man of this stamp is, with us, of far more avail than a thousand applauding testimonies from the superficial million.—ED. M. M.]

IMPROVED EXCAVATOR'S WAGGON.



Sir,—The accompanying sketches represent an improved sort of waggon, *which was used for removing* the earth at *the excavation of the new entrance* to the London Docks. It is a well known fact, that if clay is mixed with water and a little sand, it forms so compact and cohesive a mass, that when carted to a dis-

tance of two or three hundred yards, it is next to impossible to uncart it without the help of pickaxe and shovel. The soil to be excavated in the present instance being very much of this description, it was the general opinion that the ordinary kind of excavator's waggon would be of little use; and being in the employment of the contractor for the work, I therefore set about contriving such an alteration in the construction as might meet the difficulty of the case. After several trials, with different models, the one of which I now send you a description was found the most suitable. We had a good many waggons constructed on this plan; and I was very happy to find, that when the mode of using them came to be understood by the workmen, they answered our purpose admirably.

Description.

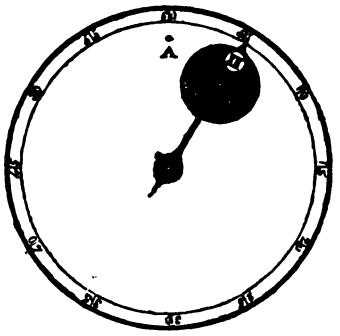
Fig. 1 is a side-view of the waggon when emptying. B, shows the line of the barge at high-water. TTT, are whole timbers. H, are half-timbers on each side of the waggon to secure the iron rail, *r*. The distances from TT, and also between the rails, are left open, to allow the tail of the waggon to drop through, as in fig. 1.

Fig. 2 shows the method of securing the tail-board at top and bottom. At J is a joint, to allow the wheels to run out, and at K a catch to secure the axle; *s*, is a strap, bolted to the side to secure the tail-board at the top.

The course followed on emptying the waggons was to push them forward to one of the timbers, as at T, and then to allow the bottom to slide down the timber gently. A man on each side then pulled up the rods, as at R, which lowered the catch K, when immediately the wheels went out, down went the waggon, and the earth dropped out. Nine times out of ten the clayey mass went down into the barge as solid as if it never had been dug. I had almost forgotten to add, that the waggons were about 4 inches wider at the tail than at the head. The drawings show the axles bent, but they were not all so; the more bent, however, the axles are, the more easily the waggons are managed.

Yours, &c. J. WALKER.

SIMPLE CLOCK.



Sir,—The above is the representation of the dial-plate of a clock, which I lately contrived, to show the hour and minute with one hand. It consists of a fixed dial-plate, divided, as is usual, into 60 minutes, through the centre of which turns an arbor, making one revolution in twelve hours, on which arbor is placed a hand, as seen in the figure. Near the extremity of the hand is a small circular perforation, under which is exhibited the hour XII; this, and all the other hours, are engraven on a circular plate, which turns freely on a centre-pin, and has 12 teeth on its circumference somewhat like those of a common month-wheel of a clock, with a spring which acts into them, to keep the hour in a proper position in the opening. The operation of the arrangement is necessarily as follows:—The hand turning once round the dial-plate in one hour, comes into contact when at 60 minutes with a pin A underneath, which shifts the plate to the hour; this is done every revolution, precisely the same way as in some clocks for exhibiting the day of the month. The time indicated in the engraving is 5¼ minutes past twelve—the hour seen through the opening being XII, the point of the hand being over the five and one-fourth minute on the minute circle. The number XII remains stationary until A comes again over 60, when the pin underneath will shift the hour-plate one degree forward, and I (o'clock) will be seen through the opening. Two wheels only are necessary for this clock, as will be found explained in my communication on the Franklin clock, in vol. xvi. p. 114.

Yours, &c. E. HENDERSON.

110, Duke-street, March 8, 1832.

SCIENTIFIC ABSTRACTS FROM FOREIGN JOURNALS.

1. *Steam Producing Powers of different Metals.*

In the last No. of Silliman's American Journal of Science, we find an account of some interesting experiments by Professor Johnson, of Philadelphia, on the quantity of steam evolved and time required by heated metals. There is every reason to believe that explosions have often happened, especially on board vessels, by the water being either splashed or returning over parts of the boiler which have been highly heated; and in the arrangement of the boilers in the American steam-boats this is especially likely to be the case. Hence it becomes important to know, what power of suddenly raising steam from boiling water such heated iron would possess; and this was done in the experiments, by plunging the metal into a certain portion of weighed water at 212 degrees, contained in a vessel, itself guarded by a coat of green baize, cotton, &c., so as to prevent loss of heat, and attached to a scale-beam. The vessel could hold 28½ lbs. of water at 60 degrees; when 14 lbs. of boiling water were put in, it required 14 hours for the temperature to sink to 115 degrees; the temperature of the place being 80 degrees.

When used, 15 lbs. of water were put in the vessel suspended to the scale beam, and the water and vessel raised to 212 degrees by heaters. On making the experiments, the hot metal was introduced, either at once or more gradually, covered over with a perforated cover, and the metal always withdrawn upon the cessation of ebullition; the loss of weight was then ascertained. As it was difficult to ascertain temperatures above the boiling point of Mercury, a barely red heat in day light was chosen as a standard of comparison between the different metals, and different masses of the same metal; and as it is probable that the heated parts of boilers are seldom raised above a dull red heat, it was thought that, for practical as well as theoretical purposes, that point would be most interesting and important. The experiments to determine the period of *greatest activity*, show, that just below the point of visible redness in daylight, the greatest quantity of steam is generated in a given number of instants; such, at least, is the case when the experiment is performed under ordinary atmospheric pressure, and the point, therefore, has been termed the comparable temperature.

The following is a Table of Experiments, with rolled iron boiler plate, 25½ inches long by 7½ broad, and 3-16ths thick, exposing 395 square inches of surface, and rolled into an open coil. The water was at 212 degrees, the barometer 29·9; and the room was from 80 degrees to 85.

Weight of Metal in oz. Avoird.	Time in Seconds.	Oz. Avrd of Steam.	Steam from each oz. of Metal.	Oz. Metal for one oz. of Steam.	Observed heat in daylight.
144	40	10·75	·0746	13·395	Black heat.
144· 25	90	16·	·1189	9·016	*Comparable*, or dull red in daylight.
144· 25	90	16	·1109	9·016	Do.
144 125	90	16·	·1110	9·008	Do.
144·125	90	16·	1110	9·008	Do.
144·	70	16·5	·1145	8·727	Rather hotter; plunged sooner.
144·	150	19·75	·1371	7·291	Clear red; immersed by degrees.
144· 25	120	20	·1386	7·2125	Bright red.
144·	90	21·	·1458	6·857	Brighter red.
144·	90	22·5	·1562	6·400	Very bright; metal yielding easily.

The coincidence of the 2nd, 3rd, 4th, and 5th experiments is remarkable, and proves that, at the temperature of comparison, 9 lbs. of wrought iron will generate 1 lb. of steam under atmospheric pressure. In after experiments, it was found that,

but for the caution taken to avoid waste and error, the effect might have been produced in 25 or 30 seconds, instead of the time noted.

A second series of experiments was then made with wrought-iron cylinders, 6 inches long, 1·7 in diameter, having a surface of 38 square inches, including the hook; the water being, as before, at 212 degrees.

Weight of Metal in oz. Avoird.	Time in Seconds.	Oz. Avrd of Steam.	Steam from each oz. of Metal.	Oz. Metal for one oz. of Steam.	Observed heat in daylight.
62·5	42	4·	·0640	15·625	Black; iron immersed at once.
62·5	45	4·	·0640	15 625	Do.
62·5	45	5·25	0840	11·904	Do.
62·5	48	5·5	·0880	11·363	Do.
63·	120	7·	·1111	9·	Dull red, *comparable*, immersed by degs.
63·	120	7·	·1111	9·	Do.
63·	120	7·	·1111	9·	Do.
63·	120	7·	·1111	9·	Do.
63·	80	7·25	·1150	8·689	Do.; immersed quickly.
62·5	90	7·75	·1240	8·064	Fair red; do.
63·	150	8·	·1270	7·875	Do.; by degrees.
63·	150	8	·1270	7·875	Do.; do.
62·25	100	9·5	·1365	6·552	Full red; immersed at once.
62·25	120	10·5	·1686	5 298	Bright red; do.

Experiments 5, 6, 7, 8, and 9, correspond closely with 2, 3, 4, and 5 of last table, and show, that at the comparative temperature, iron in this form, as well as in plate, produces 1 lb. of steam for 9 lbs. of metal.

By a third series of experiments with cast iron, it was found that, at the comparative temperature, it could generate more steam than wrought iron, 8½ lbs. nearly being sufficient to produce 1 lb. of steam. This effect is justly attributable to a difference in the specific heat of the two substances, which may well exist, considering the difference of their composition.

2. *Comparison of Prussian Weights and Measures with the English.*—(Professor EYTELWEIN.)

One English inch, at 62 degrees Fahrn. = 0·971140 Prussian inch at 61½ Fahrn. An English pound avoirdupoise of 7000 grains = 31·018012 Prussian loth, 32 of which are a Prussian pound

An imperial gallon = 253·95383 Prussian cubic inches.

3. *French Toise.*

1 French toise — 1·949036 metre = 6·394950 English feet.
1 „ metre — ·513074 toise = 3·280899 „
1 English foot — ·156573 toise = ·304794 French metre.

T. H. B.

Feb. 11, 1832.

BARKER'S MILL COMPARED WITH THE COMMON OVERSHOT WHEEL.

Sir,—Hezron says (vol. xvi. p. 175), he cannot see why Barker's mill may not be superior to the common water-wheel, because, forsooth, a fall of water is necessary in both cases. This is true; but it was for this very reason I described the whole *contrivance as useless*, for the head of water—that is, the difference between the levels of the pump-head and the discharging-orifice—is too small, to produce rotary motion by its reaction alone. As his remarks on this head seem to convey a challenge to me to make good the opinion I have expressed of the inefficacy of Barker's principle, I will proceed to do so, to the best of my

abilities, although I find it will again place me in opposition to the great authorities.

In the case of the common overshot-wheel, every drop of water expended adds to the power, by acting directly from its gravity through a great portion of its descent, whereas in Barker's mill the gravity of the fluid can only be said to act indirectly; consequently, a considerable quantity of water may run through the tubes, without producing sufficient reaction to overcome the friction of the working parts of the machine. Such is the unassisted opinion which I formed on comparing the two machines; but being desirous of finding some confirmation of it in the standard authorities, I referred to my library (ycleped the Library of Useful Knowledge), and turning to the treatise on Hydraulics, where I hoped to find some data that would set the matter at rest, even to Hezron's satisfaction, I soon found the article, "Barker's Centrifugal Mill," but very little information upon it, and that of a very negative description—in some parts, indeed, quite contradictory. The writer begins with stating, that "so far, the weight and moving impetus of water have alone been noticed as capable of producing power to work machinery; but a similar effect may also be obtained from the reaction and centrifugal force of water in machinery properly constructed for the purpose of obtaining it, &c. &c." He then goes on thus:—"In this the water does not act by its weight or momentum, but by its centrifugal force, and the reaction that is produced by the flowing of the water on the point immediately behind the orifice of discharge." Here we have it twice positively asserted that the power of this machine is derived solely from centrifugal force and reaction, and is no-wise caused by the weight or momentum of the water. Now it seems to me, on the contrary, quite evident that there can be no centrifugal force until it is generated by rotary motion; no rotary motion but what arises from weight or momentum; and that the centrifugal force adds to the power only by increasing the momentum. A description next follows of an engraving of the mill, but it furnishes no particulars either as to quantity or dimensions, and in effect contradicts the preceding quotations, inasmuch as it states that orifices deliver their water with a force proportionate to the perpendicular height of the column of water contained in the upright pipe, and will generate such a resistance or reaction as to throw the upright pipe and its arms into rapid rotary motion. We are then told that this machine is highly spoken of in almost all books that treat of hydraulic machinery; and that Euler agrees with Bernouilli, in saying it excels all other methods of employing the force of water to obtain motion. We must all allow that these are weighty authorities; but, after all, of what worth is any mere expression of opinion, neither supported by the evidence of facts, nor even by theoretical calculation? There is a quotation, indeed, given from Euler to the following effect:—"The power of this machine does not depend altogether on the perpendicular height of the water in the upright pipe, but on the centrifugal force that is generated in the arms, by which a much more rapid and violent discharge of the water takes place than would occur from the elevation of the head alone, and by which a proportionate velocity of motion is also produced." But if the *additional* power generated by centrifugal force is only obtained by a *proportional increase* of expenditure, where are we to look for the superiority which Euler assigns to this machine? The Useful Knowledge Society's treatise-writer also favours us with a description of De la Cour's improved Barker's mill, extracted from the 3rd volume of the Transactions of the American Philosophical Society, to which it was communicated by a Mr. Waring. We meet here, for the first time, with a statement of the proportional dimensions; it would seem, indeed, that we are indebted to our brother Jonathan for all the practical information we have on this subject. Mr. Waring says, "The radius of the arms, from the centre of the pivot to the centre of the discharging-holes, 46 inches; inside diameter of the arms, 3 inches; diameter of the supplying-pipe, 2 inches; height of the working-head of water, 21 feet above the points of discharge" (not one word, it will be observed, about the size of the discharging orifice!) "This, though a great fall, is evidently a very small consumption of water, since it was all supplied by a 2-inch pipe; and when the machine was not loaded, and had but one discharging orifice open, it made

115 turns in a minute. This gives a velocity of 46 feet in a second for the orifice of discharge, which is 9 feet and 5-6ths in a second faster than the water would flow out under the simple pressure of a 21-feet head, which great excess of velocity can only be attributed to the centrifugal force generated in the arms, and upon which this machine, in a great measure, depends for its action." Now, all that I can learn from this is, that a 2-inch pipe, under the pressure of a 21-feet head, supplied sufficient water to overcome the friction of the two bearings of an upright shaft carrying two fly-arms, and, moreover, to turn it round with considerable velocity; but that was all—there was no *disposable* power—nothing to reproduce or continue the working of the machine. It is true there was but one orifice open, and by opening the other we should gain a surplus, which might be applied to return the water (no matter by what means) to the upper reservoir; the expenditure, however, would be double; the plain English of which is, that two 2-inch pipes would be required to supply the machine, while it produces the effective or working-power of only one. How far this may be sufficient to effect the object sought, I will not at present stop to inquire, but proceed to the treatise-writer's concluding sentence:—"Barker's mill is a machine which is very warmly recommended to practice by all the eminent mechanics who have investigated the subject; and considering the high respectability of their names, and the simplicity and cheapness of the machine, it cannot but be matter of surprise that no attempts at its construction, on a large scale, have been made in Great Britain, &c." Now, Mr. Editor, I submit to all the world, whether it is not a matter of much greater surprise that not one of these highly respectable gentlemen, notwithstanding their warm recommendations of this machine, should have had confidence enough in its superiority to erect one on his own responsibility? Although I am little able to undertake the mathematical investigation of the subject, I will, nevertheless, make an attempt to do it in my own way. My calculation of the ratio between the expenditure and the power gained must of necessity be founded on the *information* contained *in Mr. Waring's description. First, then, to obtain what is called* reaction, that and that only being the prime mover, but wholly dependent for its power as such on the momentum or weight of the water, I will suppose the machine supplied from a head or reservoir 21 feet high, which will create a pressure of 9·37lbs. on every square inch of the internal surface of the arms. Now, this I take to be action and reaction, and being equal in every direction, the result is nothing but the most perfect equilibrium. But, if by removing a part of the surface, we get rid of the reaction on one square inch, we at once destroy the equilibrium and obtain a force of 9·37lbs. acting uniformly in the best possible direction to produce rotary motion; and this being gained with the expenditure of 36½ feet in a second, will generate the secondary power or centrifugal force, which will gradually increase with the velocity until it attain 115 revolutions per minute; the expenditure then being 46 feet in a second, having increased about one-fourth, but causing an increase in the momentum of one-half, making, together, the motive-power equal to 14lbs. Multiplying this by 46, the number of feet the power travels through in a second, gives 644lbs., raised 1 foot high; then dividing the last product by 22, for the height of the reservoir and clearance, the quotient 29 will be the number of pounds returned into the reservoir. As, however, both orifices must be open to produce this effect, the expenditure in the same time will be 92 feet, or very nearly 40lbs.!

I trust this will be found a full and impartial estimate of the power of this machine, at least as far as can be gathered from the scanty information before the public. Had the result proved much more in favour of Barker's principle, I should still give the preference to the overshot-wheel; because, firstly, centrifugal force, or one-third of its power, depending entirely on the velocity, every variation in that must be attended with a corresponding alteration in its power; secondly, as so much of the power is to be acquired after the machine is put in motion, it can only start with little more than half its load; thirdly, after it has acquired its maximum power, the remaining portion of its work must be connected with the utmost caution; for if the velocity is at all affected (and it is next to an impossibility to avoid this), the

power instantly decreases, and the machine must inevitably stop.

Yours, &c. TREBOR VALENTINE.

Derby, Jan. 16, 1832.

ECONOMICAL BLOW-PIPE.

Sir,—The incredible quantity of fuel consumed when the blow pipe is put into operation, has always placed a very great impediment in the way of constantly using that valuable invention. I have thought of a plan for remedying this inconvenience, and will give it to you "hot from the brain," as old Pope has it. It consists in the application of heated air to the furnace.

The prefixed sketch of a little model which I have in my possession, will be sufficient to illustrate my invention.

A is the receiver which contains the air, and is supplied through the pipe C. The lamp D has the effect both of heating the air, in the receiver A, and of acting as the furnace, through which the stream of air is to pass, which stream of air runs in a continual current from the tube B.

Yours, &c. P. P. P.

March 28, 1832.

NOTES WORTH NOTICE.

"Bulk does not constitute value: the Pitt diamond would add no perceptible increase to the weight of a load of a million-million times less cost, but of incomparably larger size."

Scientific Vanity of the French.—The attempts of our neighbours across Channel to establish a reputation for mechanical *invention, are sometimes so overstrained as to become irresistibly ludicrous.* Some short time ago, they were bent upon proving that the steam-engine, far from owing any thing to the genius of Savary, Newcomen, and Watt, was altogether a machine of French invention. In this they do not appear to have succeeded even to their own satisfaction; but the Number of the Revue Encyclopédique for December last, shows that they still have an eye to their own glory in the field of invention. It contains a notice of the volume on Natural Philosophy published by our Society for the Diffusion of Useful Knowledge, the whole and sole object of which is to enlarge on the immense importance of the water-ram of Montgolfier, which, it asserts, "irrigates the green pastures of England; gives freshness and verdure to her immense parks; and supplies with water her innumerable mansions;" whilst in France it is quite neglected. Now, it is true that the water-ram *is* used in England for these purposes, but the extent of its use is most prodigiously exaggerated by the excited imagination of the enthusiastic Frenchman; it does not yet perform quite so many wonders as the steam-engine, and, what is more, it never will, although a very ingenious invention. The whole article is written in a most lack-a-daisical strain of regret that England should be allowed to reap the profits of the labours of French "savans;" while the writer displays a lamentable ignorance of the subject on which he treats. He talks of having already noticed "*many* volumes" of the Library of Useful Knowledge," although only *two* have yet appeared. He quotes at full-length Professor Millington's description of the Water-Ram, which he especially praises for its clearness; while he translates, without correction, the monstrous mistake, that "it raises water by the motive force of *a part* of the water to be raised!" an error which was set right long ago in the Mechanics' Magazine, and might, therefore, have been rectified, as a little further on, an extract is taken from Mr. Baddeley's notice on the *belier hydraulique* in that work (or rather "*Mecanic's Magazine*," as our friend has it). The truth is, we strongly suspect, from many circumstances of internal evidence, that the whole article in the Revue was concocted from that single number of the Mech. Mag. in which the Useful Knowledge Society's description of Montgolfier's engine was extracted!

Revival of the Surrey Institution.—We are very glad to perceive, that the taste for literary institutions, which seemed to be upon the decline, has taken a decided start. On the same day that the meeting took place for establishing "The North

London Literary and Scientific Institution," (April 4th) another meeting was held in the opposite extremity of the metropolis, to consider the propriety of reviving the Surrey Institution, which, after a short and apparently flourishing career, was a few years ago suddenly abandoned. A successor was attempted on this side of the river, in Bridge street, Blackfriars, under the title of "The Metropolitan Institution; but a sufficient number of subscribers could not be procured to give success to the scheme; more recently, an association was formed at Camberwell, under the original denomination, and for some time appeared likely to attain to a permanent footing, but we believe this also has disappeared, so that the southern side of the metropolis is now totally destitute of a literary establishment. The meeting to which we have alluded resolved to supply this want, by reviving "The Surrey Institution" on the scene of its former glories, once the Leverian Museum, and since an auction-room, a horse-ride, a concert-room, and something worse—in a word, the Rotunda. Its late occupants, it appears, have evacuated the premises, and they are now, therefore, open for the reception of more respectable tenants, while the inhabitants of Southwark begin to be ashamed of their desertion of their only literary institution, and appear to wish for its re-establishment. The scheme has the approbation and patronage of the Bishop of Winchester, the members for the county, and numerous other important personages; and it is *only* the assistance of the inhabitants of South London which is wanting to ensure success. We sincerely wish it may obtain it.

Steam Carriages in London.—The public have been so often amused with theoretical vaunts on the subject of steam-travelling, that no little scepticism prevails as to its practicability. This scepticism, if we may trust to Mr. Hancock, one of the numerous steam-coach patentees, will very shortly be removed by the simple process of ocular demonstration. In a word, that gentleman has issued a prospectus of a company which he proposes to form, for running public conveyances by steam from the Bank to Paddington, Highgate, Hornsey, and other villages in the neighbourhood of London. He speaks with great confidence of his plan, which is, to begin by building three coaches at first, and with the profits of these, *after* paying the shareholders *five per cent.* for their capital, constructing others until horseflesh *is entirely superseded; or at any rate, until the company* are tired of growing rich! Mr. H. refers to the evidence before the Committee of the House of Commons for the character of his invention; but, as deeds are better than words, he would have furthered his object much more, if he had shown the probability of success from his actual experience in running the steam coach, which he started some time back on the Stratford road. A few years ago, his subscription-books would have speedily filled, but we doubt they will come somewhat tardily off *now*, although the capital required is but a few thousand pounds. A better line of road to begin upon could not have been selected; but we think it must be an exaggeration to state, as Mr. Hancock does, that the yearly returns of the coaches upon it are £120,000.

A Terrific Machine.—At one of the recent sittings of the French Academy of Sciences, a description was read of a machine for raising water, invented by a M. Cagniard-Latour. The principle of the invention is the same as that of the "Seville pump," and the greatest novelty about it is its name, which is so truly French that we have devoted a corner to its preservation. What do our readers think of such a sounding and terrific designation as "the *hydraulic volcano?*" N. B. The chief use of said volcano is to raise water for the supply of a wash-hand-basin!

Progress of Literature and Locomotion.—This is truly the age of wonders. A Parisian librarian advertises, that in his news-room will be regularly found the papers published in "France, England, America—and (after a long list)—Smyrna, *Constantinople*, ALGIERS!!!" &c. &c. &c. And we have just learned that an English stage-coach is now on its voyage to the Pacha of Egypt, who intends to run it between Alexandria and Cairo, under the direction of a veritable John Bull coachman. As, moreover, the Pachalik is destitute of turnpike-roads, his Highness issued orders in the same breath for the coach, and the road it was to run upon: labourers were accordingly immediately set to work, and as, in a despotic state, it will not do for the surveyor of highways to be dilatory, it is expected the road will be ready on the arrival of the vehicle!

Public Spirit.—Sir John Soane, the newly-knighted Professor of Architecture in the Royal Academy, has just announced his intention of throwing open his magnificent collection of drawings relics of Ancient Architecture, and, we believe, his books, for three months in every spring,

to the student and amateur. Such liberal conduct requires no eulogium. It has long been known that Sir John's collection (which is contained in his house in Lincoln's-inn-fields) is the best and most extensive of its kind in the kingdom; we understand it includes, among innumerable other rarities, the Egyptian tomb brought over by Belzoni, and for some time exhibited in London.

F. H.

Boards of Audit.—Sir, If the Bankrupt Court is as "T" states (p. 455, last vol.) a Court "whose *only* duty is the examination of the accounts of individuals," then is the Lord Chancellor's new Court *not* a model for a Board of Audit. Will "T" point out the perfection which entitles it to the honour of being distinguished as a "model?" I say it is defective, but not because the official assignees are not mathematicians, elected by the aristocratic Royal Society. Would Dr. Olinthus Gregory make an efficient official assignee? I trow not. Fix the standard, and all men will learn the proper height; a mathematician will not be wanted to explain the inches. Lord Brougham missed the glorious opportunity of making his Court the model; he might have done so; and his Lordship regrets that the season for effective improvement slipped away but half employed—"the tide" has ebbed and has borne far off the golden hour. Peculiar circumstances oblige me to withhold the name of the gentleman who proposed a perfect model for Lord Brougham's Court; to mention the plan itself would equally betray the secret, but Dr. Bowring (who is not the ingenious person I refer to) could not have schemed a better. "T" seems to understand book-keeping; but how can any one acquainted with it say it is necessary to be a mathematician to keep a merchant's accounts?—Yours, &c. T. M. B., March 31, 1832.

The Locomotive Question.—Sir, I *must* congratulate Saxula on his sublime discoveries. In his last paper, he made known that the effect of a small force applied to a powerful lever, was equivalent to a greater force applied to a less powerful lever. To-day, we are informed that a lever may be deprived of its fulcrum, and be a lever still! Prodigious!!—Saxula tells us, also, that he has come in "collision" with a patent, from which he expects more "locomotive light" than from his wheelbarrow problem. What light he may derive from it, I know not; but I opine your mechanical readers may derive more light from the former than the latter, and derive the least possible quantity after all. If Saxula will turn to my last paper, he will not find any thing said about an "imaginary fulcrum," or any such nonsense. I told him the imaginary *centre* was "*virtually* the fulcrum," or fixed point, about which the lever moved. When I see anything new or useful in Saxula's papers, I shall be happy to acknowledge it; until then, I take my leave of him.—Yours, &c. S. Y., an Engineer, March 24.

American Rifles.—"Sir, I should feel much obliged if Junius Redivivus would state where I can meet with any information as to the superiority of the American rifles over those used in Europe."—H.

North London Literary and Scientific Institution.—"Sir,—I am rather surprised that you, who are a friend of *mechanics*, should have approved of the suppression of the word "Mechanics" in the title of this Institution. I think it will have the effect of keeping away many *mechanics*, who would otherwise have been induced, by the invitation conveyed in *the title first proposed, to join the Institution.*—Yours, &c., A Tradesman; Pentonville, 7th April, 1832.

[The approbation we expressed, requires some explanation. The title originally proposed, was "Literary and Mechanics;" the combination seemed to us odd and unmeaning—as much so, as if one were to talk of a Religious and Watch-maker's Institution; and it was on this account we approved of the substitution of the word "Scientific" for "Mechanics." Perhaps, however, the better amendment would have been, to call it simply the "North London Mechanics' Institution;" for, on second thoughts, we agree with our correspondent, that the omission of the word "Mechanics" is very much calculated to deprive the Institution of the support of that valuable class of the community.—Ed. M. M.]

Advantage of a little Knowledge.—The mysteries of magnetism should be unfolded to the sailor, above all men, since he is the one of all others whose safety depends on its phenomena. He should be told that on electro-magnetic principles he would materially influence the march of the needle by wiping the glass which screens it—especially with silk. It is some years ago since a fact was communicated to me, which may be adduced in illustration; it was that of a ship which arrived at Liverpool, after having been for several weeks the sport of winds and waves; the mariner's compass having been washed overboard in a storm, their voyage was dreary and procrastinated—much caution being necessary, and despite of which, their fate, but for a fortuitous circumstance, might have been inevitably sealed. Now, had the simple fact of the extreme ease with which a mariner's needle might be made, been known to any on board, the peril might have been avoided. A sewing-needle, or the blade of a penknife, being held in an upright posture, and struck by a hammer, and subsequently floated by cork on water, or suspended by a thread without torsion, would become a magnetic-needle, and point north and south; or the end of a poker held vertically, and passed over its surface from one extreme to the other, would impart magnetism, and which, if the needle be of steel, would be of a permanent character.—*Mr. John Murray.*

INTERIM NOTICES.

"Scientificus" has left a blank for certain "instructions." Can he favour us with a copy?

We cannot advise a "Westminster Subscriber" to proceed with his scheme at all. He has got a power of locomotion in his own limbs—if they are sound, and he will but use them to which all the machinery in the world can add nothing whatever.

Mr. Butterman is requested to look at our Interim Notices in No. 432. He will, probably, see there the cause explained.

Has our correspondent of "Victoria Cottage," quite satisfied himself about the "100 feet?" To us, it seems, in truth, "incredible."

Communications received from R. D. J.—J. H.—Sp**olides—Mr. Tidmarsh—D****R—Mr. Deakin—Dubitans.

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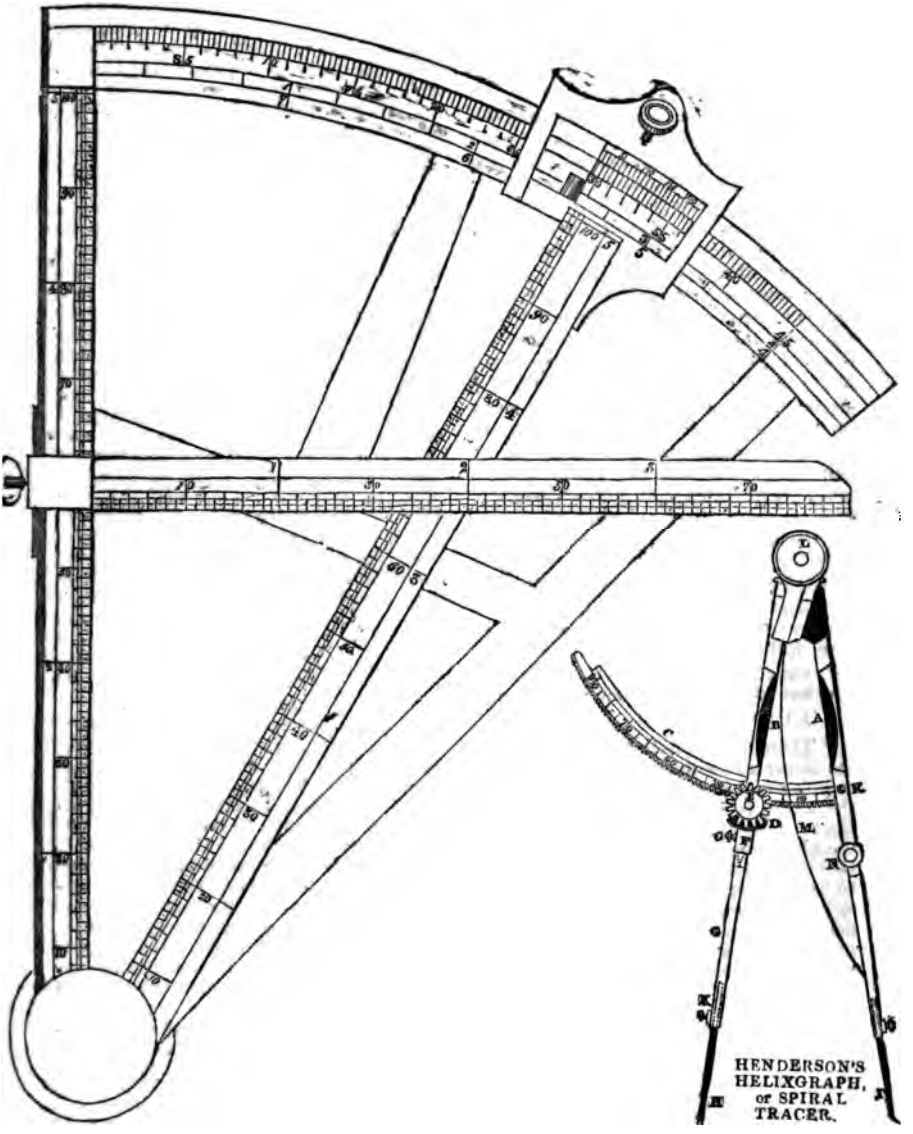
CROW'S SEAMAN'S OCTANT AND TRAVERSE WORKER.



HENDERSON'S HELIXGRAPH, or SPIRAL TRACER.

CROW'S SEAMAN'S OCTANT AND TRAVERSE WORKER.

The land surveyor has his sliding-rule; why should not the navigator also have his instrumental calculator? Mr. Crow, late of Gravesend, now of London (37, Windsor-terrace, City-road), has furnished an admirable answer to this question, in the Octant and Traverse Worker, represented on the preceding page. The construction of the instrument is so simple, and its utility so very obvious, that we wonder something of the kind has not been invented before. Seamen work their reckoning at present with the help of printed tables of sines, tangents, &c., which are calculated on the principle, that the sine, tangent, and secant of every angle correspond with the sine, tangent, and secant of the circle which measures that angle, and that the sides of the angle are in the same proportion, one to another, as the sines of the opposite angles. Mr. Crow's octant does this work for them mechanically, and with an accuracy to which no pen and ink or printed calculations can possibly pretend. The instrument is of a triangular form, each of the three sides representing the sine, tangent, and secant of the opposite angle. The arc is graduated to 45 degrees, which are subdivided by a vernier into minutes; in the ordinary traverse tables, degrees only are given. The following additional explanations we extract from a small descriptive treatise by Mr. Crow, which accompanies the Octant:—

"There is a double row of figures to the degrees, to denote angles and their complements in either case; that is, when the angle is less than 45 degrees, the lower row become the complement of the given angle, and the contrary—only that the minutes found on the vernier are to be subtracted from 20′, and the difference added to the complement will be the degrees and minutes greater than 45 degrees. When the given angle is less than 45 degrees, the index is to be placed over it on the arch, in the usual way. Observe always to count from left to right when the angle is less than 45 degrees, and from right to left when it is more than 45 degrees. The same observation applies to the scale of rhumbs or points, which are immediately below; *for if the course be three points*, it shows at once its complement, five points underneath; and if five points be the given course, then the diff. of lat. is found on the slide and departure on the divided limb. Now for the three sides of the triangle:—

"First. The diff. of lat. is on that side upon which the slide traverses; and it is also called the divided limb. Here the diff. of lat. is always to be found or layed off, if the course is not more than 4 points or 45 degrees.

"Second. The dep. is the slide, and traverses up and down; upon which the dep. is always to be found or set off, when the course is not more than 4 points or 45 degrees.

"Third. The distance or index. On this side of the triangle the dist. is to be found in the angle of intersection with the slide.

"With respect to the diff. of lat. and dep., one general rule must invariably be observed—it is this: That when the given course is more than 4 points or 45 degrees, these sides change names; and so they always do when the diff. of lat. is less than the dep. For if it be a 5-point course, the diff. of lat. is then to be found on the slide, and dep. on the limb; and the same is to be observed when the diff. of lat. is less than the dep.; that is, set off the diff. of lat. on the slide, and the dep. on the limb, when these are given to find course and dist.; and the angle of the course thus produced will be found on the arch, and must be read off from right to left, as it will be more than 45 degrees.*

"Fourth. To find or set off any required number on the sides of the triangle on the common scale, No. 10 to 100 on the limb and index, and to 75 on the slide. Required that the slide should be placed to 53·2 on the diff. of lat. or limb. First, find 53; then take the first subdivision next to this last, is $\frac{2}{10}$; to this place the edge of the slide, and you will then have on the diff. of lat. side 53·2, the number required. But this number may be called 53·20, thus bringing out the result to two decimal figures, which is equal in accuracy to the table of logarithms, only with this great advantage, that the results are had by the instrument tenfold easier and quicker. The same numbers may also be counted 532. Now the large scale is numbered 1 to 5 on the two longest sides, and 1 to 3 on

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"* To work and read off by this instrument, it is intended that the heel, or angular point, should be towards the body.

the slide. This scale is convenient when working for the meridional diff. of lat. as it frequently happens to run up to thousands. If short boards are made, as 2 to 6 miles, which often happens in light airs and calms, any distance is readily set off, and the corresponding results expeditiously obtained. Now to suit our convenience, we may assume the first 10 on either of the sides, on the common scale, as 1 or unity, and 20 above as 2, 30 as 3, &c.; then will the first division, which is cut up to the second line be $\frac{1}{10}$, and the longer division $\frac{2}{10}$, &c. &c. In like manner may the first 1 on the large scale be assumed as 10, 2 as 20, 3 as 30, &c.; then will all the longer divisions from 1 to 2 be each 1, or unity, and the subdivisions between these will each become $\frac{1}{10}$. Also may the 1 on the large scale stand for 100, 2 for 200, &c.; the subdivisions then are 1 each. Now admit the distance run to be 6 miles on a S. W. by S. or 3-point course—place the chamfered edge of the index to 3 on the arch, then bring the slide to cut 60, which now stands for 6 miles, the dist. run, and it is done. On the limb is 5′ for diff. of lat., and on the slide is 3′·3, or a little more, for the dep."

The treatise from which we have made the preceding extract, contains also numerous examples of the mode of calculating by means of the instrument; and these are so distinct and clear, that he must be a dull sailor indeed, who, after reading and working them, should find himself at a loss to resolve, by means of the Octant, any case whatever in practical navigation.

We should think it a matter of regret, were this instrument to supersede altogether what Jack calls head-work; but we apprehend, it is quite as likely to lead him to the sufficient reason in most cases, as the means he at present employs. Of books, there is a mechanical use, as well as there is of instruments. To what Mr. Crow says on this head, every inquisitive landsman who has traversed the deep sea can bear witness.

"How few among that useful class of men, the plain practical sailors, are able to go to any extent into the basis of the science of Navigation, and who continually are working their various problems without ever thinking further than that they are to add together certain numbers and subtract others; and that if they do this right, they at *last arrive at the desired result! This instrument will* insensibly impress upon the minds of those who use it, that in every triangle all the parts bear a rigid and definite relation to each other, and that having certain things given, certain others can thence invariably be found; and that any three things that can be brought to the shape of a triangle, become, by that, objects of simple computation, whether they are distance, difference of latitude and departure, or the main mast, a main shroud, and the horizontal line joining that mast and shroud along the deck."

Besides; as the results produced by this instrument must necessarily be perfectly correct, it furnishes an excellent means of verifying computations, and must, on this account alone, be of great use to the young and inexperienced.

We earnestly hope Mr. Crow will not go without the reward which he deserves for this valuable contribution to nautical practice. He acknowledges to have received "liberal support and approval from the Hon. East India Company;" but speaks of the introduction of the instrument into the Royal Navy, as "a hope yet to be indulged." How is this? To whom can the improvement of navigation be of more importance than to the government of this, the first maritime nation in the world? Thousands and tens of thousands have been lavished by it on inventions (Rotch's fid, for example) of not a tenth part the importance.

HENDERSON'S HELIXGRAPH, OR SPIRAL TRACER.

Sir,—The accompanying drawing (see front page) is a representation of an instrument lately invented by me for tracing heliacal or spiral curves. A B are the two legs of the instrument, the same as a pair of common compasses, turning on the joint L. A is jointed at N, that it may allow the point I of the tracer to be vertical over the paper, when tracing the spiral. Into A is made fast, by means of the screw R, the quadrantal arc C, having 90 teeth on its circumference. The arc passes freely through a rectangular perforation in the leg B, at which place it takes into a pinion of ten leaves (not seen in the drawing); the axis of this pinion is made square on the outer part, and on this is placed the small bevil wheel E of 15

teeth, which takes into a similar wheel of 15 teeth which is fixed horizontally to the top of a small sliding tube F, which slides on the leg B, and may be affixed to any part of the leg by means of the small tapped side screw *o*, which presses on a wire inserted in the leg B. The part marked G must be considered in this description as distinct from all above it, for G is nothing else than a piece of cylindrical brass, with a perforation at bottom, into which is inserted the prong piece H, and secured there by the side screw K; while in a conical hole at the top, the arm B turns with all imaginable freedom. The prong H being always in the centre of motion, it keeps all in connection with it perfectly steady whilst the instrument is in use. The horizontal bevil wheel being one of those parts which are fixed, it causes the vertical wheel E to turn once round its own axis along with the before-mentioned pinion of ten leaves; which pinion takes into the teeth in the quadrantal arc, and causes it either to advance or recede, according to the direction given to the tracer. M is a spring which serves to keep the leaves of the pinion in tight action with the teeth of the arc. Let us now suppose the tracer I and prong H in conjunction. By giving the instrument one entire revolution, it will be found to be distant from the point from which it started, a space measured on the arc by the traversing leg equal to 10 degrees; because the pinion, having just ten leaves (or teeth) and turning once round in one entire sweep, a progressive motion is given to the tracer, and after a few turnings, a finely-delineated spiral line is produced. When wheels of equal numbers of teeth are in unison, as is the case in the instrument here represented, the recession or precession will equal 10 degrees; but the instrument can be so rectified and adjusted, as to give almost any distance between the spiral spaces, by having a few sets of wheels of various numbers of teeth.

We shall, for present exemplification, suppose that the horizontal bevel wheel E has 15 teeth, and not to be exchanged —then a wheel of 30 teeth being inserted on the axle of pinion 10, the horizontal wheel must be lowered, by sliding it down and adjusting it to the size of a wheel of 30 teeth, which will be easily affected by observing how they act into each other's teeth, which, I may remark, should be with the greatest possible ease. Wheel 30, being now supposed to be in unison with the fixed horizontal one below (of 15 teeth), 30 will be so effected, that it will take two revolutions of leg B to effect one of wheel 30; the space measured on the arc will equal 5 degrees in each revolution, and so forth in proportion to the numbers in the wheels placed on this axle.

The following Table will exhibit the spaces measured on the quadrantal arc, when any of the undernoted wheels are inserted on the axle of the pinion :—

Numbers of teeth in the wheels.	Revolutions of the pinion.	Measured span on the scale.
5	3	30°
7	2 1/7	21° 428
10	1 1/2	15°
15	1	10°
20	0 1/2	7° 500
30	0 1/3	5
45	0 1/5	3° 333, &c.

In the above Table, it will be observed, that were a wheel or pinion of 5 leaves to be inserted on the axle of pinion 10, that pinion 10 would revolve 3 times round its axis in one revolution *of 5*, and thus cause the space measured on the arc to equal 30 degrees. And were a wheel of 45 teeth inserted in its stead, pinion 10 would be so effected that while leg B and its furniture made one revolution, 10 would only have effected one-third of a rotation, and the

measured space on the arc, answering to this, will be observed to be 3 degrees, 333, &c., and so of the rest.

Yours, &c, E. HENDERSON.

Duke-street, Liverpool,
Nov. 15, 1831.

INDIAN ARTS AND MANUFACTURES.

No. IV.*

Method of sowing Rice—Receipts for making Chitni and Curry.

At sea, near Bombay,
Oct. 22, 1831.

Sir,—In endeavouring to beguile the tedium of a short voyage down the coast, by looking over some old numbers of the Mechanics' Magazine, I met with an inquiry by Ceres (vol. vii., p. 15) for the most advantageous manner of sowing seed corn. An instrument similar to that used by the natives of Guzerat, in sowing their rice and some other kinds of grain, may perhaps be of service to him. Three hollow upright bamboos, about two feet long, are fixed together in a row, about six inches apart; at the bottom of each bamboo is a piece of iron, slanting downwards to enter the ground, at the top of the bamboo is a wooden cup or bowl to hold the grain; to the bamboos is attached a pole, which, by means of a short cross piece of wood, is drawn by a pair of oxen. The cup at the top is kept constantly filled with seed, which, falling through the bamboos, three rows of grain are deposited about two inches deep in the ground, which is immediately afterwards harrowed. If there is a chance of too much grain falling through the bamboos at once, a small quantity of dry earth may be mixed with it.

I observe another inquiry, at page 156 of the same volume, by "A Young Grocer," regarding the best manner of roasting coffee. My cook, who is an excellent hand at extracting the real flavour of the mocha, which is as far superior to the slops that go under the name of coffee in England, as any substance bearing the same name can well be, informs me that the coffee must be roasted on a thin unglazed earthen pan, with a small piece of butter, about the size of a hazel nut to a pound of coffee. The Arabs omit the butter, but their manner of preparing coffee does not quite suit the European taste; it should be roasted very slowly, and will take about half-an-hour to be properly done.

There have lately been a great many advertisements in the papers, puffing off Bengal Chitni and Curry powder and paste. I forward you two of the most approved receipts for the same, which I hope will be of use to some of your readers:—

To make Bengal Chitni.

1¼lb. dry red chilis.
1lb. unripe mangoes.
2lbs. red tamarinds.
1lb. sugar candy.
1¼lb. fresh root of ginger.
From ¼ to 1½lb. garlic.
1½lb. sultana raisins.
1lb. fine salt.
5 bottles best vinegar.

The chilis must be soaked for an hour in vinegar, and every thing must be separately ground to paste on a stone, (similar to that used by painters for their colours) and then mixed together.

The above receipt I bought at Surat from a famous Parsee, who makes a great deal of Chitni, which he sends to different parts of India; for mangoes I should think unripe apples might be substituted, and probably white sugar for sugar candy.

To make a good Curry.

Coriander seeds, 6 drams.
Turmerick, 1 dr. 1 scr.
Fresh root of ginger, 4½ dr.
Cummin seeds, 18 grains.
Black pepper, 2 scr. 14 gr.
Poppy seed, 1 dr. 1 sc. 14 gr.
Garlick, 2 heads.
Cinnamon, 1 scr.
Cardamoms, 5 seeds.
Cloves, 8 heads.
Chilis, 1 or 2, according to taste.
Half a cocoa nut grated.

The whole of the above ingredients must be ground together, excepting the cocoa-nut, on a stone similar to that used by painters.

The above is sufficient for a small fowl, or about a pound of meat. I have weighed the above by "apothecaries' weight," having no other means of weighing them at hand. The poppy seed is of that kind from which opium is extracted.

Yours, &c. BENGEE.

* The communication on the palm tree, in No. 448, p. 407, should have been headed No. III.

SINGLE LINE RAILWAYS.

Sir,—The very great expense attendant on the first formation of railways, has no doubt the effect of disseminating some unfavourable opinions respecting them, and of deterring many persons from investing their money in public works of this character, from an opinion, that for such immense outlays, few situations could be found, from the trade of which an adequate interest might reasonably be expected. Much certainly of the first cost of works of this description depends on situation and local circumstances, as well as on the generally-expensive nature of the work itself, and districts may undoubtedly be found, where a sum of money so expended would be comparatively thrown away; yet, in all probability, if a similar work could be formed to answer the same purpose equally well, for half or a third of that sum, a profitable return might be safely calculated upon. For instance, two towns may be so situated, for want of sufficient trade, and other circumstances, that to form a double line of railway between them would be attended with more expense than the estimated trade upon it could possibly be expected to repay; whereas, if the whole of the trade carried on between them, could be effected by one line of railway, the first cost might be so far reduced, as to render the payment of interest on the capital expended, a matter of certainty. That many places, where railways would be found of very great utility, are so situated, I have no doubt; and my object in the present communication, is to endeavour to show, that the working of single railways is perfectly practicable, not only in those situations where the expense of a double line would be the greatest objection to its introduction; but also in those, where the great extent of the expected traffic, would appear to render a second line indispensable.

I should, in fact, have no hesitation in saying, that the present trade on the Liverpool and Manchester railway (great as it is) might be as easily carried on with a single line of railway as it is at present with two. Let us, for example, take these two towns, and suppose a single line of railway laid between them, with a passing place of half a mile in *length just half* way. We will call the *distance between Liverpool* and Manchester thirty miles, and will suppose, that the trains, including stoppages, travel at the rate of fifteen miles per hour, or the whole distance in two hours. With this arrangement, one, two, or more trains, might leave each end of the railway every two hours, and by traveling at equal rates, would reach the middle of the railway at the same moment, when, after passing each other, they would proceed to their respective destinations without the slightest interruption, inconvenience, or delay. It might so happen, that the trains leaving each place only every two hours, would not be sufficiently often for the accommodation of the public at all times; if, therefore, two other passing places were added, each at half the distance between the middle one and the ends of the railway, they might then, in almost any number, leave each place every hour—a frequency of intercourse sufficient, probably, for any two towns in the kingdom.

The successful operation of the system would depend principally on the strict observance of the hours of departure, and the rate of travelling, both of which would, of course, be previously determined upon. In order to ensure regularity in this respect, each engine-man should be furnished with a time-piece, similar to those carried by the guards of the coaches, except that the dial, instead of being divided into hours, should be divided into as many parts as the trains are intended to travel miles per hour; these may again be subdivided each into four parts, which would represent quarters of miles. There should then be another dial, exactly similar to that of the time-piece, attached to some part of the engine, full in sight of the engine-man, which should take its motion from one of the axles. The wheel-work of this should be so calculated, that while the engine was traveling a mile, the index should move over one of the large divisions, which represent a mile on the dial. Then, by keeping the indicator and time-piece at corresponding points or divisions, the exact rate of travelling might at all times be observed; and any trifling loss of time occasioned by stopping to take up or set down passengers, taking in a supply of water, oiling, &c., might soon be recovered, as the engine-man would im-

mediately perceive that his time-piece had got before the indicator, and would increase the speed of his engine till he had brought them to correspond with each other again. The same rule being observed by the whole of the engine-men (which, for their own convenience, they would be induced to do) would invariably bring them to the passing places at the same moment, and the whole of the trade would thereby be carried on with the regularity of the movements of a clock.

I am, Sir,
Yours respectfully,
Loco.

Nov. 5, 1831.

ENTERTAINING LIBRARY. — VEGETABLE FOOD OF MAN.*

It is now some time since we had occasion to notice the entertaining series of the Useful Knowledge Society's publications. The truth is, there has been little entertaining, in many of the late numbers, beyond the running title. One volume was devoted entirely to "Historical Parallels," in which the writer was more intent on displaying his ingenuity, in discovering curious coincidences ("there is a river at Macedon, and there is a river at Monmouth, look you"), than in catering for the entertainment of his readers; and, after all, this gentleman's researches were "of little use to any but the owner." No less than two more were taken up with a rambling history of the two French Revolutions, those of 1789 and 1830—full of guns, trumpets, blunderbusses, drums, and thunder—and breathing nothing less, for the edification of the working classes of England, than tremendous tales of beheadings, shootings, barricadings, stabbings, guillotinings, massacres, and the dismal et-cetera of French modern history. All that we recollect of these four two-shilling parts is, that the first two are most wofully destitute of novelty; and that the last two are only conspicuous for some stupid original extracts, from a MS. by a pseudo Count Tasistro (in reality, we believe, a French teacher in London), bearing every mark of a hoax on the credulity of the worthy Society—and for some dozens of Lilliputian cuts (apparently executed upon gingerbread), but most gigantic in demerit—in fact, more trashy, if possible, than the kindred things which decorate the history of Dame Trot and her Cat, and are pronounced "quite good enough for children!" The Society, too, are going to raise the standard of taste, in the fine arts, among the poorer classes! They are very kind, and deserve thanks for their good intentions; but we must beg of them, in their vast benevolence, not to forget the old proverb, "Charity begins at home!"

We hailed the announcement of the present volume, "Vegetable Substances used for the Food of Man," with no small satisfaction, and looked forward to the appearance of a book in which the subject—not a badly-chosen one—should be set forth and illustrated in the best possible manner, and written in the agreeable style of the earlier publications of the entertaining series—the "Menageries," the "Pursuit of Knowledge," the "Insect Architecture," and the "New Zealanders." Of this style the former volume of "Vegetable Substances" (timber trees and fruits), but especially the first part of it, presented a very tolerable specimen; scientific description was varied and illustrated by original anecdote, and also by apt pictorial embellishment. We have been, however, sadly disappointed.

In the first place, the writer has had no room for his strength; he is allowed so small a space for the large body he has to deal with, that its limbs have been terribly crippled in the operation of compression. Thus, the article "Tea," is obliged to be cut short in a few pages; and the other "companions to the break fast-table," coffee and sugar, are in quite as bad a predicament; so that the information which is gained upon these interesting heads, is just "worse than nothing at all!" This is a defect, however, which may yet be remedied; for it is evident, that tea, coffee, and sugar, especially with their collateral relations, porcelain, earthenware, &c. &c. are quite of sufficient importance to fill a whole volume, and that by no means a frivolous or uninteresting one; and such a volume, we hope, will form very shortly a part of the Entertaining Library.

Another thing, is the deplorable dry-

* Vegetable Substances used for the Food of Man.—Lib. Entertaining Knowledge. Vol. xv. London: C. Knight, 1832.

ness of the details. In almost every case we are presented with merely a meagre description of the vegetable under notice—a pithless conjectural account of its origin, and a drowsy sentence or two on its mode of cultivation. The man, indeed, who reads this volume of the Library of Entertaining Knowledge by way of entertainment, will be in as pitiable a situation as he who toiled through Blair's Grave for the sake of its fun, merely because it was companion to Swift's Tale of a Tub, in an edition of the British Classics; at any rate, he will be cousin-german to the original, who used to peruse the London Directory for the sake of amusement! It is, in fact, as dull as it well could be, and partakes considerably of the form, as well as the dullness, of a dictionary, or a gazetteer. An extract will bear out our remarks, and give the best idea of the whole; for our own sakes, it shall be a short one.

"The capsicum is a native of tropical regions; but is become so far acclimatized in this country, as to be successfully reared, and, during summer, to endure the open air uninjured.

"Three species of capsicum are cultivated in England. The Guinea pepper —*capsicum annuum*—was introduced into England from India so early as 1548, and is mentioned by Gerarde as being under cultivation in his time. This plant has a branchy stem, rising about two feet high; the leaves are long, narrow, and of a dark green colour. White flowers bloom in June or July, and are succeeded by pods, varying in shape and colour; some being long, others short, some round, and others again heart-shaped—while the colour is either red or yellow.

"The cherry pepper—*capsicum cerasiforme*—is a native of the West Indies, and was not cultivated in England until 1759. This species is very similar in appearance to the first, and is only characterized by the different shape of the pods, which (ake somewhat (of) the form of a cherry—sometimes heart-shaped, bell-shaped, or angular; their colour is the same as the preceding.

"Both these species are annuals. The bell pepper—*capsicum grossum*—is a biennial, a native of India; it produces larger pods than either of the others,"—et cetera, et cetera, et cetera, to the end of the chapter.

And this is a fair specimen of the *staple* of the book, not selected with an eye to effect, but simply copied from the first page which presented itself; indeed, you meet with little else than such lacklustre sentences from beginning to end. Others might have been taken likely to give a much worse idea of the work. In the very next page, for example, we have this exquisitely English sentence—"The stem is *ligneous*, sending out many *lateral* branches (as if branches could be any thing else than lateral); the shoots rise two or three feet, and then become *procumbent*." How clearly described—how entertaining! This latinity of phrase is another besetting sin of the volume, almost of as great magnitude as its dullness. The very embellishments partake of the prevailing characteristic, consisting almost entirely of mere figures of the plants described, without any back-ground or other accessories; while there are no views (which we looked for) of ancient and modern gardens, the farms and fields of foreign parts, or the many interesting processes used in preparing the "vegetable food of man."

SHORT AND LONG CRANKS.

Sir,—I have been very deeply interested, for some time, with those communications, in your valuable magazine, which have arisen from the discussion of the new theory of locomotion, set forth by your ingenious correspondent Saxula. An idea has lately entered my mind, which, though not new in itself, will, I conceive, be of some weight against the theory. It is simply as follows:—According to the definitions which have been given of the terms statumotion and locomotion, the latter, it is evident, must be the result of a statumotive power applied from the machine. Now we will suppose the statumotive power of a steam-engine to be applied to a crank, on the axle of a locomotive engine; then it is evident, that the result of the power will be communicated through the centre of the axle, and consequently that of the wheels, and from thence radiated in repulsion to the resistance caused by the obstacle in the front of the wheel. Where, therefore, in this case, is the necessity or advantage of a long crank? It is self-evident, that a power increased or diminished in inverse ratio to the

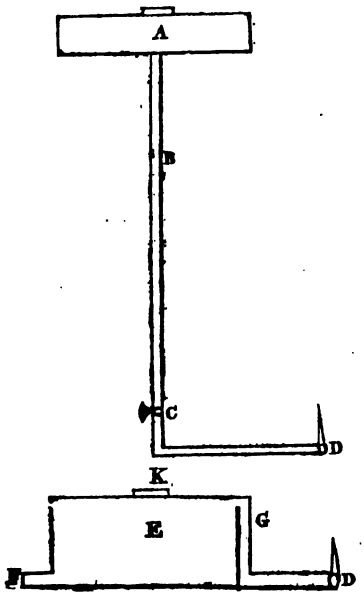
length or shortness of the crank will have the same effect upon the centre of the axle, and consequently upon the centre of the wheel, and from thence on the periphery or point of resistance. I need not add, that whether the power be applied to the axle, or to a certain point (equidistant from the centre), on the spokes of the wheel, the effect will be the same; and from this I deduce that the power must, in all cases, proceed from the centre of the wheel, and that there is no advantage to be derived from the use of a long crank. Again, suppose the obstacle to be in front, and the power acting upwards on the hinder part of the wheel, where then does Saxula contemplate or anticipate the advantage of long cranks?

I hope, ere long, to have the pleasure of sending you an account of a few experiments which I am myself about to commence; the power I intend to apply, is that of a spring. In the mean time, I beg to subscribe myself,

Yours, &c. DUBITANS.

Farnworth, April 3, 1832.

HYDROSTATIC LAVEMENT INSTRUMENT.



Sir,—The plan prefixed represents what I call "a hydrostatic lavement instrument;" and will put into the hands of many an industrious mechanic, who cannot afford the price and subsequent expense of Mawe's instrument, those means of relief from the disorders peculiar to the sedentary, with the unattainable prospect of which the other did but tantalize them.

B is a tin tube of small diameter, surmounted by and communicating with A, a flat cistern, capable of holding three half-pints, or a quart. The tube has a stop cock C at its lower extremity, and another tube turns off from it, at a right angle, which is made to receive at its extremity the injection pipe D. The mode of operation is obvious. The liquid to be injected is put into A and B, and, on turning the cock C, will be injected with a rapidity proportioned to the degree to which the cock is opened. That is to say, when the liquid employed is as fluid as water; when, however, it is thick and viscid, so as to be incapable of exerting the hydrostatic force, the following supplementary apparatus is required.

E is a separate cistern of the same capacity with A, and having the tubes F and G coming from it, as in the figure; each of which tubes may at pleasure be adapted to the vertical tube B, or receive the injection pipe.

E receives the thick injection, being charged by the mouth K, which must immediately be closely corked. A and B are filled with plain water; and upon putting F or G in communication with B (according as the thick fluid has a less or greater specific gravity than water) and then turning C, the operation is performed as if water only was employed. The instrument, which I got made to prove the invention by, cost under five shillings, is as efficacious as Mawe's, and cannot go out of repair. I have already made it locally public; but I think it deserves general notoriety.

Yours, &c. F. T. C. D.

COAL MINE EXPLOSIONS.

Sir,—The very interesting letter of Humanitas, in the last volume of the Mechanics' Magazine, p. 456, relative to explosions in coal mines, must create, in all who read it, a strong feeling of

compassion, and an anxious desire to remove from the suffering colliers the dreadful danger to which they are at present exposed; arising principally, as appears by various accounts, from sudden eruptions of carburetted hydrogen. You may probably remember my applying to you, about four or five months back, through the Mechanics' Magazine, for the names of the great coal mine proprietors; having, as I imagined, discovered a certain remedy for explosions, I wished to communicate with them upon the subject. However, I thought it would be better first to have the advice of some competent person, and accordingly waited upon a gentleman in London, eminent as a lecturer upon Mechanics. This gentleman's observations stopped for a time my proceeding. In the first place, I was told "my plan had been long known," which was, in fact, a method of introducing atmospheric air, equal in quantity to the hydrogen withdrawn. The general idea, I now believe, was known, but not my particular plan for the purpose. That it would succeed, I have not the least doubt, in all cases where the emission of hydrogen is neither sudden nor to a great extent. Neither am I without strong expectation, that an effectual remedy, under all circumstances, will ere long be discovered. I was informed, in the second place, "that the coal mine proprietors were perfectly indifferent to the welfare of the colliers,—that they seldom or ever went near them, and that they were aware there were plenty of persons always ready to fill the places of those destroyed in their mines." The want of attention to Mr. Ryan's applications, certainly induced, in some degree, such a belief. But I most sincerely hope, the late dreadful accidents will have the effect of awakening the great mine proprietors to a proper christian feeling, and lead them to give every encouragement to those individuals who may be disposed to discover, if possible, a remedy for so great an evil.

That the remedy must be perfectly independent of the labourers; that is to say, that whatever plan is proposed, its action must in no way depend upon the care or attention of the miners, would appear particularly necessary. For I was assured, in the third place, "that what from habit, indifference, and carelessness, *they are in no way calculated* to forward their own comforts and safety; and that many of the unfortunate accidents might have been prevented, by a proper use of the Davy lamp." Upon the whole, I think these observations are just; at the same time, they should not prevent inquiry for a remedy, but act as a greater stimulus—when, I doubt not, but a desirable end will be obtained.

Being at a loss (with, perhaps, many others) to clearly understand some of the terms made use of in collieries, I shall feel obliged by answers to the following queries:—Are the backs or cleavages natural fissures in the beds of coal only? Of what width and depth are they generally; that is, both the beds of coal and backs? Do the fissures run longitudinally, horizontally, or transversely? Are the drifts, passages left after removing the coal? What is meant by the terms "Gashead" and "Fault?"

Yours, &c. G. L. S.

Enfield.

GORDON ON LOCOMOTION.*

The late Parliamentary Report on Steam Carriages has furnished the ground work for a very well-conceived and well-executed volume, which has just been published by Mr. Alexander Gordon, one of the witnesses examined on the occasion. It is a systematic treatise on the entire subject; in which we have discussed—first, the importance of substituting mechanical for animal power on our public roads,—next, the varieties of mechanical power, as derived from condensation, expansion, and exhaustion,—then the rise and progress of steam carriages in particular,—lastly, the advantage of steam travelling on common roads, as compared with railways, and canals; and under one or other of these heads, there is embodied nearly the whole of the evidence contained in the Parliamentary Report, with plates of all the boilers, engines, and carriages, referred to by the different witnesses. The work is written throughout in a very intelligent and manly spirit, and may be read with profit, even by those who are already

* Historical and Practical Treatise upon Elemental Locomotion, by means of Steam Carriages on common roads. Illustrated by Plates. By Alexander Gordon, Civil Engineer. 192 pp. 8vo.—London: Steuart.

familiar with the materials, out of which it has been chiefly compounded.

Mr. Gordon displays his strength most in those parts of his book which relate to the national advantages to be gained by the substitution of machines for horses. He demonstrates these very clearly, nay, eloquently; though, perhaps, in too absolute a sense, and now and then, not without the help of a little fanciful embellishment. We are assured, in one place, that during the last century, there were persons who "promoted petitions from counties in the neighbourhood of London, praying Parliament not to extend the turnpike roads into remote parts of the country, lest these remote districts, by means of a less expensive labour, should be able to sell their agricultural produce in the London markets, at a cheaper rate than themselves,"—and, in another, that "when private carriages became common in this country, an act was passed to prevent the too great adoption of these vehicles, lest the horses should consume the food of the poor." It would be treating these statements too seriously, to ask Mr. Gordon for his authorities. Such things may have been told him, but it could have been in joke only.

Of all the steam boilers that have been yet invented, Mr. Gordon considers that of Mr. Gurney the best for locomotive purposes. He refers for proof of this, to the report of Mr. Crawshay, inserted in the Mechanic's Magazine, Vol. xvi. p. 409.; and adds the following testimony of his own :—

"My opinion was however previously formed, in consequence of long experience with four of these boilers, as three distinct pieces of machinery under my management. In one of these works, I had one of his boilers constantly under my eye for two years. Our difficulties lay in the length of the pipes what were apt to choke up with fur. Since that time, various improvements have been made, and the result is exhibited in the constant and steady work of the locomotive carriages at Gloucester, and the said recent report of Mr. Crawshay."—p. 109.

With respect to the duration of boilers, we meet with the following interesting particulars:—

"In this particular, Stephenson and Co.'s are less valuable than Gurney's. The chemical deposit called fur, is with difficulty cleaned *out; the heat from* the fire-place and flues is not transmitted to the water with sufficient rapidity, and hence a deterioration of the boiler. A remarkable instance of one boiler lasting longer than another was mentioned by Mr. Thorold, to the institution of engineers. He had under his eye two boilers constructed at the same time. The cross section of one was a circle, and the cross section of the other was of a crescent shape, with the horns downward. In the cavities of the horns (or legs) of the latter, which rested on the brick-work of the furnace, the fur and mud collected so readily that the water could not carry off the heat from the fire with sufficient rapidity. These legs of the crescent-shaped boiler, consequently became red hot, and in three weeks the boiler was useless, whilst the boiler first mentioned, whose cross section was completely circular, had worked for *nine years and a half* without repair, and the engine during that time was uninterrupted in its working, except for the purpose of cleaning. It is an error to suppose that the deposit can be blown off with the water, like as much muddy water; as much of it as is composed of mud, may be got rid of by blowing off, but the chemical deposits of fur require to be chipped off. The owners of tubular boilers have got rid of this fur partially; the boiler, when *red hot*, casts scales of fur, which are blown out sometimes with the mud; but such a remedy is as bad as the disease. Mr. Gurney, by removing the plugs at the corners of his tubes, can chip and rake out the fur; the plugs on the tubes, and the flaunches on the larger chambers giving the most perfect facility for so doing." p. 104-5.

Mr. Gordon thinks that steam power can be applied with more advantage on common roads than on railways, and that railways are even inferior to canals; which last assumption he holds to be incontestably made out by the published letter from Mr. Graham, of the Forth and Clyde Canal Company, to Mr. Nicholas Wood, and to which letter he refers. We differ entirely from Mr. G. on both points, and look upon Mr. Graham's letter as a very self-interested and fallacious production. At present, however, we have not time to go at large into the questions he has raised; and shall merely, for impartiality's sake, quote so much of his argument as appears to consist of matter of fact; some portions of it the reader will find equally new and remarkable.

The Cromford and High Peak Railway.

—Not one ton of all the great commerce announced in the first account, has ever passed on it for the whole distance, and no carriage whatever, except that which conveyed the Committee on their triumphant tour at its opening; all the trade having been confined to that of a little coal at the southern end."—p. 146.

Liverpool and Manchester Railway.—"What moving power should be used, or rather in what way that power should be applied to give the greatest advantage on a rail road, seems to be a question still to be discussed. Messrs. Walker and Rastrick, after much investigation, reported to the Directors of the Liverpool and Manchester Railway, that stationary engines were the best. That company, however, adopted locomotive engines, and *now the Directors think of abandoning them*, and adopting either stationary engines or horses. It forms, therefore, a very interesting question, what can be the cause of this? After reading Mr. Crawshay's letter, and the evidence before adduced as to the wear of other locomotive carriages, we must conclude that such carriages could not cost £1500 per ann. each, as we are well informed the repair of those on the Liverpool and Manchester line amounts to. It is quite possible that this sum may be exaggerated, but a fact corroborates its truth. Last summer, that company had *seventeen* locomotive engines, only *five* of which were fit for work, and the company had to borrow one from the Bolton Railway; at present, (and in general) that company have only six of their locomotive engines fit for use; the rest of the *twenty-four* are under repair! Much of their expence must be accounted for by the wearing out of Messrs. Stephenson and Co's boilers, and by the too great speed of the alternating piston. But the rise of 1 foot in 96 feet on the Whiston and Sutton inclined planes, put that Company to great additional expence."—pp. 147-8.

We shall conclude our notice of Mr. G.'s work, with quoting from it the following Mount Pisgah view of what steam carriages are to do for this much afflicted nation. Happy shall we be, if but one tithe of the author's brilliant anticipations are realized!

"Oppressed with taxes and national debt, with an increasing pauperism and decreasing employment, we are just verging upon that crisis in our affairs, when the fortunes of all other states similarly circumstanced, have irretrievably declined, and in which it becomes a matter of imperative interest and concern, that the whole of the upper classes of society should combine to direct their wealth, activity, and intelligence, to the adoption of measures, which, judiciously devised, and vigorously executed, shall create a new impulse and tone, under the ribs of death of the operative classes of society. Skill and enterprize can never long enable a country to maintain competition with younger rivals, when the rate of profit becomes reduced so low as to tempt the capitalist to seek a more lucrative investment in newer lands; and long before this, Great Britain would have sunk from her proud position at the head of nations, had not continuous gigantic strides been made in manufacturing and commercial knowledge, had not every day developed new inventions and fresh resources to multiply her wealth, and extend her capabilities. But all this is not sufficient,—the evil has been grappled with, not exterminated; and the project which can alone consolidate our greatness, renew our body politic, and sustain us in the energies and vigour of a wholesome existence, still lies behind. Now it unclogs the subject of a vast weight of insuperable difficulty to consider that the want of *method* is one bane, and not the want of *means*; that ignorance has matured the distress into which the country is unnecessarily precipitated; and that knowledge, judiciously directed, can yet dissipate it, and give it to the winds. The aggregate wealth of this great country remains unparalleled, and is amply sufficient to meet and remedy the exigencies of our case. We are not called upon to embark in an Utopian scheme to procure the *means*—that might baffle us—and afterwards to devise the *mode*. The former amply provided, we have only to relieve from the immethod and fatuity of its present appropriation, and we have made to our hand what will render the completion of the latter a project of comparative facility and ease. The scheme is not a brilliant chimera irreducible to practice, but is laid up and embraced in this simple axiomatic proposition, which opposition may challenge, but we defy to overthrow:—That the food of the country, properly converted, is fully sufficient (*i. e.* that if appropriated to the sustenance of men instead of horses,) to extinguish pauperism: and that the fund by which that pauperism is at present upheld, encouraged, and fostered, can furnish the MEANS by which the conversion in question may be effectually realized."—P. 173.

EXPERIMENT TO ASCERTAIN THE EFFECT OF THE REMOVAL OF THE OLD LONDON BRIDGE ON THE NAVIGATION OF THE THAMES—ACCIDENTS FROM THE STEEPNESS OF THE SOUTHWARK APPROACHES.

Sir,—Many of the most scientific men in this country have given it as their opinion, that great, indeed, very alarming alterations will be caused in the navigation of the Thames, by the removal of the Old London Bridge, especially for some distance above bridge. Not being over burdened with business, and feeling considerable curiosity on the subject, I set about making a model of the river, and its bridges, from Old London to Vauxhall inclusive, paying particular attention to the widths of the river at each place, and to the width of the piers and water-ways. I confess I was persuaded, in my own mind, the result would be as predicted—injurious to the navigation, and dangerous to the banks and wharfs But what is the result? I contrived, in my model, to have my Old London Bridge moveable; and I find, to my astonishment, that the tide flows and returns in precisely the same time, with the bridge away, as when standing. My poor brains were on the rack to know how this could be, considering that the water-way, with the old bridge standing, is 376 feet less than when removed. However, I was not long in discovering the cause. Although the old bridge, with its numerous arches, occasioned a dam of three, four, and sometimes of six feet, on the rise and fall of the tide; this dam can only be considered as having formed a wedge-like head of water, for a short time, above the general level. The greater the head of course the greater its weight; and this weight would press through between the starlings, and small arches, with more velocity than it would do were there no bridge—no dam there; but almost as soon as it had passed those narrow passages, its great velocity would be at an end; and this wedge-head would lessen as the tidal waters exhausted their force in the distance. The same quantity of water would, therefore, find its way to its journey's end, bridge or no bridge.

All the difference that will be found according to my experiment, will be in the height of the tide a little below bridge on *the rise, and below on the fall; but there need be no alarm as to any injury* likely to occur to the wharfs, banks, or other bridges. I have before alluded to the inconvenience of the approaches to the new bridge on the Southwark side, and almost every day furnishes some new illustration of the fact. One day last week, three horses lay sprawling, with loads upon them, on the New Fish Street Hill into Tooley Street, and that on a fine day too. What then may be expected during a severe winter of frost and snow? I saw a fine horse, worth I suppose £40, that had fallen under his load, going down this hill some time ago, one of its limbs was broken, and it was found necessary to complete the work of destruction, by knocking it on the head on the spot. Is not this too bad? The public ought to be better accommodated where millions are professedly expended for the purpose.

I am, Sir, yours, &c.
JOSEPH TIDMARSH.

East Place, Lambeth, April 2, 1832.

LOSS FROM SMALL STOPPAGES OF MACHINERY.

Dear Sir,—Emerson says, "practical mechanics might be very much improved, if the secrets of all trades were to lie open." It is, at all events, certain, there are many circumstances occur to manufacturers, which, if published, would be of no harm to them, and yet very beneficial to others. I may instance a case which lately happened where I am employed, and which may occur again in any manufactory where steam-boilers are used. Our paper machines had been at work about two hours, (on a Monday) when it was found that the boiler that supplied the steam to the steam rolls, for drying the paper, had such a leak as to be useless. It had been at work day and night for nearly six years. Having a new boiler in readiness, we proceeded to substitute it for the old and leaky one, but the taking off the feed head, steam pipes, man hole, steam valve, &c., and fitting them in the new boiler, with brick layers, &c., took up two days and nights. By Wednesday noon, however, the steam was up with the new boiler, so as to dry the paper on both machines. I used white lead and strong paper for joints. This, though not very engineer-like, dries soon, and answers very well for small boilers at low pressure. In the mean

time the machines were making upwards of 300 reams of printing paper, which had to be pressed, parted, and hung on lines to dry, after the old fashion, which caused not only a good deal of extra work, but a quantity of waste, which is never the case with steam rolls. Neither did the loss end here, for the quality of the paper was two or three shades worse than usual, and worth less by three rubles, or 2*s*. 6*d*. per ream, making a total loss on the 300 reams, of from 35*l*. to 40*l*. pounds sterling!! We have here a striking exemplification of the loss which may arise from a very trifling stoppage of machinery, and the publication of it may have this advantage, if it have no other, to induce engineers, in all manufactories, to look well to their boilers. It furnishes too, a strong proof of the utility of a set of copper drying rolls, in saving of time, preventing broken paper, and improving the colour.

Yours, &c. WM. REED.

Peterhoff Paper-mill,
Aug. 10, 1831.

IRON ROOFING.

Sir,– In your eighth volume, page 328, there is an account of patent cast-iron plates, for roofs of churches and other buildings. A roof of this kind will be, no doubt, very excellent and durable, more so, perhaps, than any other whatever. The circumstance of a patent having been taken out for it, puts me in mind, however, of the words of Solomon, "There is nothing new under the sun." Within a mile of where I reside, there is a blacksmith's shop, and other buildings, covered with cast-iron plates; the exact time when they were laid on I could not ascertain. A Mr. Cary, an old English blacksmith, who has worked there upwards of forty years, told me they were put up at least thirty years before he came, and nearly about the time when several miles (!!!) of iron pipes were laid down for the immense fountains of Peter the Great's palace at Peterhoff. These cast plates weigh about 9lbs. per square foot, are 16 inches by 12, and lap over in the manner of common pantiles, having two prongs cast on each of about 2½ inches long, by which to hang them on the roof, which *is at an angle of 60 degrees. They look very little the worse for their long* service, and have no appearance of ever having been painted.

I am surprised that sheet-iron coverings, now universally made use of on all new buildings in Petersburg, Moscow, &c. should not have been yet adopted in England. In the case of a fire, no harm can come to a house from sparks falling on a roof of this description. Then think of the beauty of them when painted a fine green, with the rest of the house white or a stone colour. Gentlemen's country houses, and all the best houses in Petersburg, are so coloured. The sheets of this iron covering, measure 2 feet 4 inches wide, by 4 feet 8 inches long, and weigh 12½lbs. avoirdupois per sheet, or 1 lb. 5 oz. each superficial square foot. When the sheets are on the roof, they measure only 2 feet wide by 4 feet in length; this is owing to the overlapping. They are first painted on both sides once, and, when fixed on the roof, a second coat is given. The common colour is red, but green paint, it is said, will stand twice the time. Small bits or ears are introduced into the laps, for nailing the plates on the 2-inch square laths on which they are secured. It takes 12½ sheets to cover 100 feet, the weight of which is only 150lbs., the cost only 35 shillings, or about three pence per foot. Two men will turn up and fix 50 sheets a day, which will cover a space equal to 400 feet; wages, about three shillings a day per man.

Note.—Some old women may think there is some danger from lightning, but there need be no apprehensions on this score; architects know to the contrary.

Yours, &c. WM. REED.

Peterhoff Paper-mill,
10th Aug. 1831.

THE CHANGES IN THE SEASONS NOT IMAGINARY.

The figure of the earths' orbit round the sun is such, that we are sometimes nearer to this great source of heat by three millions of miles, or one thirtieth of the whole distance, than at others. Now it so happens, that we have been drawing nearer and nearer to the sun every winter for several thousand years. We now actually reach the point of nearest approach about the first of January, and depart farthest from the sun about the 1st of July. Whatever benefit,

therefore, is derived from a diminution of the sun's distance, goes to diminish the severity of winter; and this cause has been operating for a long period, and with a power gradually, but slowly, increasing. It has at length arrived at its maximum, and is beginning to decline. In a little more than ten thousand years, this state of things will be reversed, and the earth will be at the greatest distance from the sun in the middle of winter, and at the least distance in the middle of summer.

We are speaking, it will be observed, of the northern hemisphere of the earth. The condition alluded to, to take place after the lapse of ten thousand years, is already fulfilled with regard to the southern portion of our globe, since their winter happens at the time of our summer. How far the excessive cold, which is known to prevail about Cape Horn and other high southern latitudes, may be imputed to this, we are not able to say. There is no doubt that the ice has accumulated to a much greater degree, and extended much further about the south pole than about the north. Commodore Byron, who was on the coast of Patagonia on the 15th of December, answering to the middle of June with us, compares the climate to that of the middle of winter in England. Sir Joseph Banks landed at Terra del Fuego in latitude 50° on the 17th of January, about the middle of summer in that hemisphere, and he relates that two of his attendants died in one night from the cold, and the whole party was in great danger of perishing. This was in a lower latitude by nearly 2° than that of London. Captain Cook, in his voyage towards the south pole, expressed his surprise that an island of no greater extent than 70 leagues in circumference between the latitude of 54° and 55°, and situated like the northern parts of Ireland, should, in the very height of summer, becovered many fathoms deep with frozen snow.—*American Almanack.*

Berzelius not dead.—We are happy to have to announce that the report of the death of the father of Swedish chemistry turns out to be unfounded, although the news was given in as positive a manner as possible in the continental journals. So far was it from the truth, that the contradiction has arrived simultaneously with the intelligence of the annual grand meeting of the Academy of Sciences at Stockholm, at which *Berzelius read his usual Memoir* on the *Progress of Chemistry during the past year*, in the presence of the King, the Crown Prince and Princess, and a brilliant assemblage of the highest personages in the kingdom. We hope it will be long ere the event which has been thus falsely reported, will really take place. The scientific world has of late lost so many illustrious members, that the lives of the survivors have become tenfold more precious than before.

Vapour Baths.—A correspondent at Ely puts rather an embarrassing inquiry:—"Which of the many vapour baths which we see advertised in the newspapers, and which owe their being apparently to the pestilential character of the present crisis, do you think the best?" The least invidious way of answering this question will probably be, to mention the sort of bath which we make use of ourselves. It is one manufactured by Savage, of Wardour-street, Oxford-street, and is very simple, consisting merely of a close boiler with safety-valve—a tube of three bends, with stop-cock and regulator—a rose-like disperser at the end of the tube—a cane chair, with an elevated seat and footstool—and a coarse calico envelope, which is distended at breast-height by means of a hoop, upheld by a girdle that projects from the top of the chair back, and drawn by a running string over the head or round the neck. It is very easy to use, not at all liable to get out of order, and is withal very cheap.

Hot Air Baths.—Mr. La Beaume, of whose skill in the application of galvanism to the cure of diseases most of our readers must have heard, has just published a small Treatise (on the Portable Sudatory, or Hot Air Bath) in which he reminds the faculty that it was by him the Hot Air Bath was first invented about fourteen years ago, and introduced in practice under the patronage of the late lamented Dr. Armstrong. He passes some severe but not undeserved strictures on the meanness and dishonesty of the host of Hot Air Bath makers, who have recently started into notice, and joined, as it were, in one common endeavour to "rob the projector of his meed of praise, and plunder him of his pecuniary reward." The Treatise is well worth reading on other accounts than the personal claims of the author. It contains the details of a great number of cases in which the efficacy of the Hot Air Bath was very successfully exhibited, and also some curious remarks on the applicability of galvanism, as a cure for cholera in its earlier stages.

New Galvanic Battery.—In the Treatise alluded to in the preceding notice, we meet with the following remarkable and somewhat startling announcement:—"In the frontispiece of my last work on Galvanism, I gave a representation of several galvanic batteries I had constructed for my professional use, and others which were intended for prompt application in suspended animation, which apparatus is so portable as can be conveyed in a walking-stick or waistcoat-pocket.* So minute a battery, made with the ordinary materials, could not have developed sufficient influence, had I not happily discovered other combinations than zinc and copper, which increase the power of galvanic excitation to an astonishing degree, and render the apparatus more potent than four of Cruikshank's troughs of one hundred pairs of plates each! This discovery opens a wide field for observation, as it is directly opposed to the supposed laws of galvanic excitation laid down by that great chemist, Sir Humphrey Davy. "My little apparatus is an improvement of De Sanctis's piles, on Aldini's principle; it can be instantly excited to develope an adequate intensity of galvanic influence for suspended animation,—and, by a few simple directions, a child may apply it, even in extreme cases, with ease and safety. As no chemical analysis can discover the secret, I shall not, for the present, make it known, that neither the public nor myself may be damnified by counterfeits, which will, most probably, be offered for sale; and yet these

* Noticed in Mech. Mag., vol. vi., p. 549.

batteries shall be so cheaply constructed, as to meet the circumstances of the poor as well as the rich."

Hydraulic Presses.—Sir, it may be worth while mentioning, for the sake of your Hereford and other country readers, that many hay presses, on the hydrostatic principle, have been constructed and found to answer. I have also been given to understand, that some cyder presses were made by the original inventor, Mr. Bramah. I should think the reason of their not being more generally used, is the expense of the first outlay, which must fall heavy, particularly on the small manufacturer. I was somewhat surprised at seeing, in the last number of your magazine, an engraving, styled "Russell's Hydraulic Press," as the mechanical construction is precisely similar to those generally used in the sugar trade, and first introduced to public notice by Mr. Bramah, whose taste, in the construction and fitting up of machinery, may be gathered from Tredgold—who, in speaking of the different varieties of Bramah and Dickinson's patent rotary steam-engines, says:—"All the varieties are specimens of that beautiful style of executing machinery which Bramah contributed so much to introduce into this country."—Yours, &c. D****.—London, April 10, 1832.

[The heading of the article alluded to is certainly inaccurate; but the blame rests with us, and not Mr. Russell. It will be seen, from Mr. Russell's letter, that he does not himself lay any claim to the invention of the press. Mr. R. was foreman to the late Mr. Bramah; and is, no doubt, well content to have the reputation of making the Bramah presses almost—if not quite—as well as the inventor himself.—Ed. M. M.]

Gold Mines of the United States.—It has been now ascertained that the gold veins, which were at first supposed to be confined to North Carolina, extend now, in very close succession, from the vicinity of the Potomac, in Virginia, into Alabama and Tenessee. Not six years have elapsed since these mineral treasures began to be explored, and yet there are many mines already worked upon an extensive scale, and numerous mills erected for the extraction of the ore. In 1830, there were 460,000 dollars worth of gold, the produce of the Carolinas, Virginia, and Georgia, coined at the United States mint. It is stated, however, that by far the larger part is sent to Europe, to France particularly.—"The chief miners," says a correspondent of the *New York Observer*, "are foreigners—Germans, Swiss, Swedes, Spaniards, Englishmen, Welshmen, Scotchmen, &c. There are no less than thirteen different languages spoken at the mines in North Carolina. And men are flocking to the mines from all parts, and find ready employment."

Pedomotive Carriages.—We must abide by the advice we gave a Westminster Subscriber in our last Number. Going for a short distance at the rate of eight miles an hour, or going even eight miles absolutely within an hour, is a very different thing from travelling for a continuance at the same speed. We *do* hold it to be impossible for an individual to travel faster in the long run, in a machine propelled by his own personal strength, than he would do by employing his limbs in the usual and natural way. Man is a locomotive machine of Nature's own making, and not to be improved by the addition of any cranks or wheels of mortal invention. The velocipedes which were in vogue several years ago, had as fair a trial as invention ever had; and they were universally abandoned, simply because it was found there was nothing to be gained by them.

Busk, Keene, and Co.'s Boiler.—Sir, In addition to your correspondent Fair-Play's "Account of the new Engines as fixed in the Steam-boat the Queen Adelaide, I may state that they occupy a space of four feet in length, and five feet seven inches in breadth. The small space thus occupied by engines *on* this construction, will go far to establish their *superiority in steam navigation*; the boat is about 65 feet long, eight feet nine inches breadth of beam, and draws about two feet of water. The Diana draws, I believe, two feet six inches of water.—Yours, &c., J. E.

Twenty Ducats for a Comet!—The King of Denmark has offered a gold medal of the value of twenty ducats to be given to the person, whether native or foreigner, who shall first discover a telescopic comet (that is, not visible to the naked eye) and not of known revolution. Each claimant must send notice of his discovery to Professor Schumacher, of Copenhagen, by the first post afterwards, and fix the time of the discovery as well as he can, in order to enable the Professor to decide between different observers.

Admirable Example.—The Constitution of Indiana—one of the new States recently added to the American Union, contains the following important provision:—"It shall be the duty of the general Assembly, as soon as circumstances will permit, to provide by law for a general system of education, ascending, in a regular gradation, from township schools to a state university, *where tuition shall be gratis, and common to all.*"

White and Black Longevity.—It appears from the last census of the United States, that in 1830, there were 2651 persons then living of the age of one hundred years and upwards, of whom 531 (only) were whites, 741 free blacks, and 1379 slaves. The disproportion between the whites and blacks is extraordinary; and though there may be some truth in a remark which we observe is subjoined to this table of longevity, that "the ages of the blacks are not generally so well known as that of the whites," it seems to us to furnish but a very indifferent explanation of the result.

INTERIM NOTICES.

Is R. S. aware of Morton's Patent Slip?

We had overlooked Mr. Francis's paper; it shall have a place soon.

We see no reason to retract the opinion of which W. H. H. complains; if we did, we should do so most willingly.

We have some doubts on the question referred to us by the "Fair star-gazers;" perhaps some of our astronomical friends will help us to the proper answer. The question is this:—"Whether Saturn is *exactly* in the centre of its rings?"—We have an impression, that some recent observations have shown the contrary to be the case.

Communications received from R. O.—Mr. Harper—A Recovered Patient—Alexis—An Inquirer—A Puzzled Gardener.

ERRATA in the communications of our Indian correspondent, Bengeir:—

Vol. iv., p. 357, l. 18 from the bottom, for "retired," read "reduced."

Vol. xv., p. 110, l. 7 from the top, for "buoyancy," read "resident."

Vol. xv., p. 110, l. 4 from the bottom, after "300 feet in height," add "3 miles."

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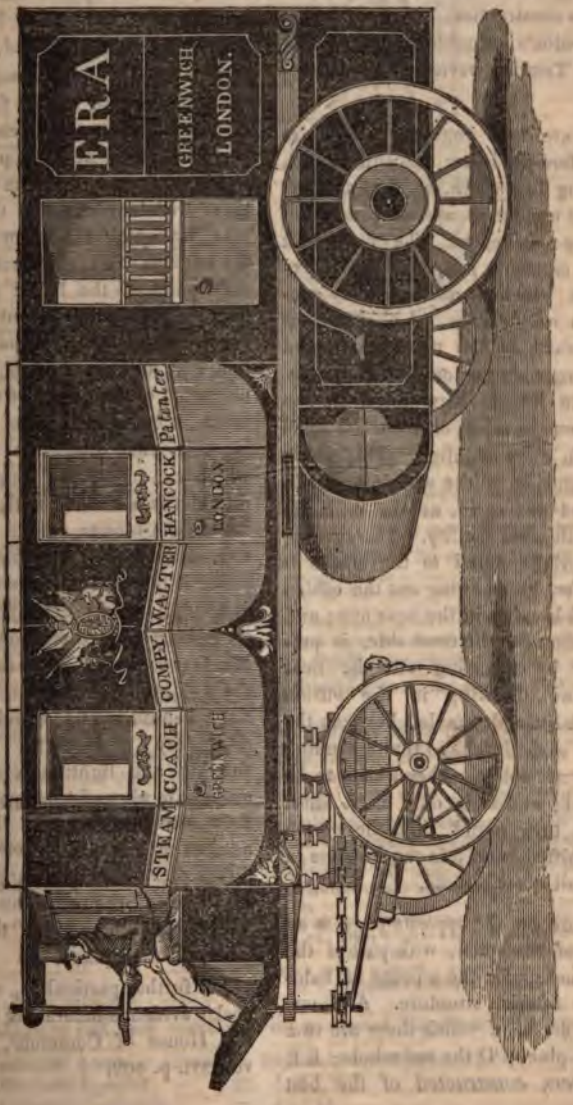


HANCOCK'S STEAM CARRIAGE.

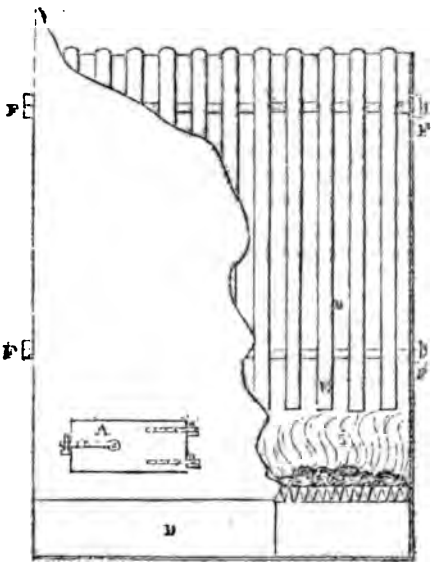
HANCOCK'S STEAM CARRIAGE.

The engraving on our front page represents a new steam carriage, which Mr. Walter Hancock has just built to run on the road between London and Greenwich. For the following particulars of its construction, we are indebted to Mr. Gordon's valuable Historical and Practical Treatise, reviewed in our last number.

There are two engines, which are placed before the boiler and turned with the stuffing box down, so that the cylinders are uppermost, and the piston and connecting rods below. The crank shaft with two cranks is supported by a flexible frame, which provides for any concussion on rough roads. A chain passes over a sheave on the crank shaft, and over a larger sheave on the hind axletree. The wheels turn loose on the axle, and one or other, or both, are fixed by a clutch when required. This clutch is on the outside of the wheel, and can be screwed out or in, as the case demands, with great facility. The turning of the carriage round to the offside is prepared for, by throwing out the offside clutch and keeping in the near one; and the turn round to the near side, is prepared for by throwing out the near clutch, and throwing in the offside clutch. A little play is left between the catches in each clutch, so that a winding road may not oblige either wheel to be disengaged; and it is only in a short turn, or a turn round, that the clutch must be shifted, and this can be done in a very small space of time.

The figure on the opposite page is an elevation of the boiler, with part of the casing removed for the purpose of exhibiting the interior structure. A is one of the fire doors, of which there are two. B the fire-place; D the stoke-hole; E E the chambers, constructed of the best wrought iron; F F shows the manner in which all the chambers are bolted togegether, so as to form a large boiler of many compartments. There are fillets of iron, which keep the individual compartments at a proper distance from each other; and the spaces which these fillets leave are the flues of the boiler, through which the flames ascend, as shown at H H H. All these compartments are connected at the bottom for the purpose of keeping the water in each at the proper level; and at the top the steam is conveyed from each by as many pipes as there are chambers into the steam feed pipe, by which the steam is conveyed to the engines. By this arrangement, the only parts of the boiler which can be dreaded are the sides; but good ties will keep them together. And as to the bottom end, and top of the boiler, which are composed of the edges of these compartments, if one part is burnt out or hurt, it is only that individual compartment which can burst, and its power of doing mischief is not worth notice. The fire is urged by a blower, which is driven by a connection with the engines. The waste steam is blown from the engines into the chimney, and so destroyed. The passengers are carried on the same machine, Mr. Hancock preferring that disposal of the weight to the dragging of it in a carriage behind. The wheels of the carriage are a beautiful exhibition of strength and lightness combined. The spokes are all wedge-shaped, and where they are fastened into the nave abut against each other. Their escape laterally is prevented by a large iron disc at each end of the nave; and these being bolted through, confine the spokes securely in their place.

For further particulars, see Mr. Hancock's evidence before the Committee of the House of Commons, Mech. Mag. vol. xvi. p. 462.



COMMERCIAL SCIENCE.

A Plan of Home and Colonial Colonization, upon the basis of the Reform Bill.

Sir,—Your correspondent Stadium (No. 451) desires to be informed how capital could be raised, to substitute for the mile stones cottages with gardens, for the road labourers throughout the United Kingdom?

Why, the monies which have been, and are to be received, from the Canadian, Australian, and other monopoly colonial land companies, should be appropriated to home colonization, both on the high roads and bye roads throughout the United Kingdom. The colonial lands should be advertised for public sale, at a minimum price, and then sold by—*freeholds*, to the highest bidders in the public market, in the presence of the Auditors of the Public Revenue.

The Surveyor-General of Lower Canada, Colonel Bouchette, has adopted the estimate of Mr. M'Gregor—"that in ten years a man, with perseverance and frugality, ought to have from 25 to 30 acres under improvement." (No. 452.) We have estimated 1,000,000 square feet, nearly 23 acres, to be the proportionate space in the Asiatic, African, and American colonies, to the home freehold of 1,000 shillings annual rent. Has a general estimate ever received more decisive practical proof? We have also estimated the minimum price of the colonial freehold at 100 shillings.

There have been several colonial land regulations. The last is:

1	section	=	1 square mile = 640 acres.
25	-	=	1 township.
100	-	=	1 hundred.
1600	-	=	1 county = 1,024,000 acres.

The county of Kent has been considered the garden of England; it contains:

935,600 acres × 43,560	=	40,754,736,000 square feet.
Decimil squares -	=	4,075,473.
Colonial *freeholds* -	=	40,754.
Decimil square leagues	=	407.

There are 408 parishes in the county of Kent! Which plan extends to the colonies more of the manners, and customs, and laws, of the parent country?

Mr. M'Gregor's book is a standard work upon political economy. For my estimate I am indebted to the venerable Mr. Ridout, the Surveyor-General of Upper Canada.

It has been recently stated, by Colonel Maberly, the Surveyor-General of the Ordnance, that there are 90,000 military pensioners to be settled in the North American Colonies, and Lord Howick, one of the Colonial Secretaries of State, has declared, that the present grant of 50 acres is extravagantly large, and must be reduced. Limiting the inquiry to the military pensioners:

90,000 × 50 acres -	= 4,500,000 acres.
90,000 × 1,000,000 ÷ 43,560	= 2,066,113 acres.
	2,433,887 acres

are saved to the joint colonial proprietors, namely, the poor and the rich of the United Kingdom; while each pensioner receives as much land as he can bring into cultivation, even "with perseverance and frugality," during the long period of "ten years."

Sir John Cam Hobhouse will not object to give the veteran soldier constitutional freedom. Each pensioner would receive a patent for a colonial freehold, having had deducted 100 shillings from the value of his pension. Then 90,000 × £5 = £450,000 is a capital for home colonization. Estimating the value of 10,000 square feet of home land; and the cost of a cottage of four rooms on the ground, piggery, poultry coop, fruit trees, and permanent fixtures, at £100, we have capital for 4,500 model cottages and gardens for the road labourers throughout the United Kingdom.

On behalf of the agricultural labourers it should be stated, that food is but one product of agriculture; national strength another; and that agriculture is the recruiting department of the army.

Those military pensioners, we will name them colonial pioneers, should be settled or quartered—more particularly the non-commissioned officers—so as to enhance the value of the colonial lands. Supplied, as North America is, most bountifully by Providence, and also by man, with navigable rivers, lakes, and canals, the banks of those navigable waters are preferred, and roads are almost wholly neglected.

The distance from Quebec to Montreal is	170 miles.
Montreal to Kingston - - -	150
Kingston to York - - -	140
	460 English miles.

Now, by the decimil system (omitting fractions for the present) 230 cottages for 230 non-commissioned officers, would at once protect, ornament, and enliven this, probably most uninhabited line of road man has ever travelled. It is clearly perceptible, that by erecting only 50 cottages, a country is colonized to the distance of 100 miles; while the cottages would not be more distantly separate than houses are in many parts of England, an old inhabited country.

While in North America, I was informed that as the forests are cut down—but more particularly when cut down in lines, the country is ventilated, and the climate is tempered. The breadth of the roads should be 100 feet.

It must be observed, that Mr. Fulton not only covered the waters of North America with steam-vessels, but suggested the junction of the Canadian Lakes with the River Hudson, to debouche at the Port of New York. The Welland Canal will not obstruct the view of the illustrious mechanic—which was to secure to the Port of New York, which is already the second commercial port in the world, the trade of Upper Canada.

A question then arises, whether New Brunswick, St. John's, &c., and the opposite coast, which are much more contiguous to England, and being at the entrance will *for ever command the* trade of the St. Lawrence—whether a country whose soil is, for *the most part, better than that of* Upper Canada, and which is the first maritime nursery,

either in North or South America, should not be preferred for colonization to Upper Canada, which is an inland country? The Bostonians, if not the only, are allowedly the best sailors of the United States. Nature has decided, that sailors shall belong to the coldest and most boisterous climates. I have now partly stated why I took the liberty to differ in opinion with your correspondent Junius, respecting the influence of climate. However, this gentleman has a much more minute acquaintance of America than I have, though I have been twice in that most interesting quarter of the world.

Respecting home colonization, there are, in

England and Wales -	149,337,600
Ireland - - -	77,744,000
Scotland - - -	71,152,000
Roads -	298,233,600
Add - - -	26,542,790
74,558,400 acres × 43,560 ÷ 10,000 - =	324,776,390
The population of the United Kingdom being 23,400,000, there are to each individual -	13 squares.

Even this small extent of colonial lands would produce, at the minimum price, £16,238,819.

It was calculated, in the reign of Henry the 8th, that the rood was the space for one individual; and four roods, or one acre, the proportionate space for one family of four individuals. The census of every country is composed of individuals, and not of families, for this very simple reason, that every man is not a married man. Next, it is a most unnatural hypothesis, that every married man must have, and shall not have one more, than two children! No accurate statistical table can possibly be compiled from such naturally indeterminate data. We have placed every square of colonial land belonging to the public to the credit of the public, at the minimum price of one shilling; which is, excepting the East Indies, the monetary unit of the empire.

The roads, and waters, and waste lands, being included in both estimates, the question is reducible to this inquiry:—The population having increased, would it not be political economy to reduce the individual space from 10,890 to 10,000 square feet?

Here is another view:—European Spain is the most crowded, and enigmatically, the least populated country in Europe. We have all heard of the *Chateaux en Espagne.* There being no country houses, the landlords live in towns; the farmers and farmers' labourers in villages. In the United Kingdom, the population is also very partially distributed. London has been compared to England (only) as the head of a giant on the body of a dwarf.

London is the capital of the	23,400,000.
And its population is - -	1,275,000.

Of course the value of land is determined by the number of inhabitatants who reside on it: as in England, the shortest road to raise the value of land, is to establish a town of manufactures in the vicinity.

Next to a community of language, nations are connected by a community of weights and measures. This question has been most eloquently maintained by the Westminster Review. Though I have dissented—*protested* is the more fashionable expression—against some of the commercial principles of Dr. Kelly and Dr. Bowring, I must do myself the justice to say, that I have not forgot the respect which is due to those gentlemen. *The committee* on the Bank of England Charter will pronounce *judgment between us.*

To return to the subject under discussion: listen to the New York merchant on the Paris Exchange calculating the English pound weight of 16 ounces! The English farmer is bothered with the Irish acre. The Irish farmer is bothered with the English acre. The Scotch farmer is bothered with both. The English, Irish, and Scotch, land measures, lineal and square, are as disunited as the most bitter enemy of the United Kingdom could wish. Three systems of geography (a universal science), three statute miles, three statute acres, three systems of statistics, and three systems of legislation for a United Kingdom, is an outrage upon the human understanding.

Your correspondent, Stadium, will permit me respectfully to remind him, that the Greek stadium was:

600 feet = 400 cubits.
The East Indian is 6,000 - = 4,000 cubits.

The antiquaries have here indisputable proof that the English was the original Greek foot. The Roman stadium was 625 Roman feet.

Now, 625 feet English × 16 = 1 East Indian cosmographical league.
625 feet English × 32 = 1 Portuguese league, or East Indian haraday.

Upon referring to a map, we find that the South American coast of the Atlantic is measured by the Brazilian, or British East Indian league. Next that, the European, and, more extensively, the African coast of the Atlantic, is measured by the Portuguese, or British East Indian league. Then, the Straits of Mozambique, the Malabar coast, the Coromandel coast, the Mysore, and the Mahrattas, by the Portuguese—not by the English league!

Let 30 English miles be the radius of any circuit in England. Then

30 miles = 15 decimil, or British East Indian leagues.
20 - = 10
10 - = 5
2 - = 1

Now, would a farmer's waggoner lose his road, by simply bearing in mind that father and mother make two? All that I ask, to unite the monies, weights, and measures of the most extended empire which has ever existed, with the monies, weights and measures of nearly all the foreign nations throughout the world—without altering the standard of length or weight, and, I may add, capacity—without, which is most material, interfering with the several national prejudices, is to be allowed to employ your correspondent's signature in its original, and yet generally-received sense.

My proposition (No. 448) is—and as the government have resolved to take the management of the roads, the subject is the more interesting—

That the imperial league shall be 10,000 feet.
The road labourer's garden - 10,000 square feet.

That in lieu of mile-stones on every high road and bye road throughout the United Kingdom and the colonies (at the expense of the colonies) a model cottage shall be built (to serve as Regent-street does to London) at the distance, one cottage from another, of 10,000 feet. That the labourer employed on the road immediately adjacent shall reside in this cottage, rent-free, upon the single condition of attending to the neatness and economy of his cottage and garden, and the wants of travellers. I have added, that the cottage should be lighted—suppose from the roof—throughout the night.

Your correspondent tells me, that there is a want of capital; and in the same breath, evidently however with the most benevolent feeling, that there should be double the number of cottages I have proposed.

Finally, with respect to capital:—England, being the most extensive landed proprietor—*we have followed the example of the United States, in taking land as the basis of national wealth.* The people of the United States have discharged their

national debts by the sale of their national lands.* Up to this day, no account has been rendered to the House of Commons of the sale of the English colonial lands; though the colonial lands in Asia, Africa, and America, are indisputably the joint property of the poor and the rich of the United Kingdom.

Yours, &c. T.

METHOD OF TRANSFERRING PRINTS FROM PAPER TO WOOD.

Sir,—A method of transferring lithographic prints from paper to wood, was discovered some time back in France; the process has been imported into this country, and is at present extensively employed for the purpose of ornamenting white wood articles of various kinds, and forms a favourite amusement of the fair sex.

It having occurred to me that a brief description of the process might be acceptable to some of your readers, I beg leave to place the following at your disposal.

In the first place, the article on which the print is to be transferred, should receive a coat of spa—or, of the transfer varnish, allowing a sufficient time for it to become dry: this greatly facilitates and improves the transfer, and also preserves the wood from soil or stains during the process. Having cut away as much as possible of the superfluous paper from about the print, place it in a vessel of clean water until it is completely saturated, which will be in about five or ten minutes; then place it between blotting paper to remove the superabundant water from its surface. This done, with a flat camel's hair brush spread the transfer varnish† equably over the surface of the print, and apply it immediately to the wood; lay a sheet of writing paper upon it and rub it all over with the hand, using pressure, that the necessary adhesion may take place.

With the fingers, dipped from time to time in water, peel off the paper by continued rubbing, proceeding with more caution as the print begins to appear. The rubbing and washing should be continued until the whole of the paper is removed; when dry, a coat of spa varnish will bring up the print.

If the article is to be polished, continue to apply the varnish until a sufficient body is obtained for that purpose, taking care that each coat is dry previous to the application of the next. When the whole is perfectly dry and hard, take pumice stone in an impalpable powder, and with a piece of serge moistened with water, polish until a smooth even surface is obtained. Then take the finest tripoli, and with a piece of fine cloth and some olive oil, continue the process until a high degree of polish is obtained, when the oil must be wiped off with a soft linen cloth, and the surface cleaned off with starch powder, or with Spanish white.

It is but seldom, however, that persons *polish* their articles themselves, more patience and practical dexterity being requisite for the success of this process, than falls to the lot of every one; varnishing is, therefore, a distinct occupation, performed by persons who make it their sole business, and who, therefore, attain great skill in the process.

In the above way all kinds of plain or coloured prints may be transferred to wood; but when coloured prints are used, it is necessary to employ an acid solution instead of water, to destroy the size which exists in all papers of coloured prints. For this purpose mix two-thirds of vinegar with one-third of water, and with it moisten the back only of the print, proceeding with the transfer as before directed.

The transfer process bears a considerable resemblance to lithographic printing, and it is most likely that the idea

* Our intelligent correspondent has been misinformed on this point. From a statement made up to June 30, 1828, it appeared, that the public lands belonging to the United States contained altogether 1062,403,171 acres. Of these only about 150,000,000 had been surveyed, and only 20,000,000 sold. The sum received for them is not stated; but up to 1820, the minimum price was 2 dollars an acre—since then, 1 dollar 25 cents; and it may be inferred from the reduction, that it was found difficult to procure the 2 dollars per acre. If, however, we suppose the whole of the 20,000,000 acres to have brought 2 dollars per acre, the total result would only be 40,000,000. Now, against this, there has to be set an expenditure, incident to the acquisition of these lands of 33,669,576 dollars, leaving but a trifle of clear gain to the state. See American Almanac for 1832.—Ed. M. M.

† *Prepared by Ackermann, Fullers, Riddle, and others; and to be had of most stationers in town & country.*

was suggested by it. The *rationale* of the process is as follows: the paper being saturated with moisture, does not unite with the transfer varnish, but the ink being of a greasy texture is impervious to the water, and is, therefore, taken hold of by the varnish, and securely fastened to the wood; the paper not being so held is washed away with comparative ease, leaving the ink imprinted upon the wood.

Yours, &c. W. BADDELEY.
London, April 3, 1832.

PRINCIPLES OF LOCOMOTION.

Sir,—I think Saxula does well in declining to reply to *all* that has been opposed to his theory of locomotion; the beneficial uses of discussion being to separate the chaff from the corn. Whether this subject has been sufficiently sifted for this purpose, remains to be ascertained; for my part, I believe it has not, and that S. in his conclusions, has not yet obtained a clear selection. I have always considered the subject as not only an interesting one, in the abstract, but also one of great importance as it relates to the interests of society; and in this opinion I find I do not stand alone, though some of your correspondents seem to think otherwise. This last observation must be my excuse, should it be thought, in the following attempt to throw a little more light on this subject, I may appear to be more prolix than necessary; I will endeavour to be as brief as possible, consistent with perspicuity. So to my text.

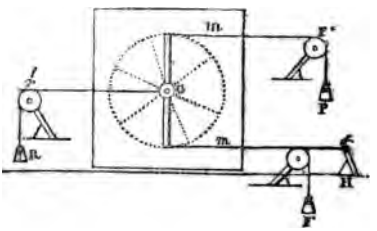
A circular wheel being acted on by a moving force applied to a crank on its fixed axis, or (which I consider the same thing in effect) to a pin, or point in its radius, the wheel moving on its axis; and which force meeting with no resistance, would necessarily cause it to revolve on its centre, but meeting with resistance, in a direction perpendicular to any of its radii, (of course, not through its centre), this resistance does virtually convert the wheel into an indefinite series of levers, admitting of a variety of cases, according to the manner and direction in which the power or force is acting on the crank or pin, and this is analogous to the case of a wheel used to propel a locomotive-machine.

In proceeding to elucidate this first *postulate, I think I hear your* readers inquire, Where is your fulcrum? I answer, if the resistance arising from the friction between the periphery of the wheel and the plane moved on, is greater than the thrust necessary to move the machine, and which it always will be on a smooth horizontal plane, the nave and axle being equally smooth, the fulcrum will be on the plane or road; but if, as in the case of an obstacle or an inclined plane, the latter happens to be greater than the former, this fulcrum gives way, and it is transferred to the axle (or its bearing on the machine, as the case may be), and then the grinding operation commences, or the machine retrogrades,[1] so far, I consider, goes to prove that the fulcrum of locomotion is on the road when locomotion is effected; when it is not effected, the fulcrum may be allowed to be at the axle; and this may prove a useful hint to any one engaged in inventing a machine for grinding materials for the roads.

By way of making this more familiar, let us consider the following cases:—

Case 1.—*Power without the machine.* —*Statumotion.*

Fig. 1.



Let the diagram, fig. 1, represent a wheel, or series of levers, acted on by the force or weight P = 1, in the direction

1. See Emerson's Principles of Mechanics, sec. 12, prop. 117, who from his demonstration there given draws the following corollary:—

COR. Hence, if the absolute external force, to move my body or machine, be given, and the machine is to be moved by an internal power; that power may be found, by supposing the machine at rest, and the external object was to be removed, and require the same absolute force to move it.

For it is the same thing, as to the power, whether the machine or the external object be moved, while the other be at rest.

He then draws a 2nd corollary, which is the general rule alluded to in note 3, but which I consider questionable. But I think we may fairly draw a third as follows:—

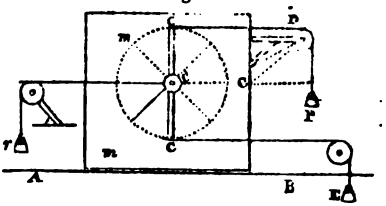
COR. 3. If the absolute external force required to move the machine be greater than that required to move the external object, then the object will be moved and not the machine.

m p, without the machine represented by the parallelogram, *m m*, and abutting or acted upon by a force or resistance in the direction *m*—F′; let this resistance be represented by the weight F = 1, while the centre of the forces is acted on by the weight R, in the direction *c* R′ = to P + F = 2. Now, it will be evident, that in this arrangement the lever would be in equilibrio, the weight R being equal to the weights P and F, and they equal to each other, and their directions at equal distances respectively from the centre, *c*. Which, then, is the fulcrum? Either, neither, or all; they are all immoveable points, or, at least, at rest, and none of them the centre of motion, as there is no motion produced, but an addition made to the weight P, and the equilibrium destroyed. Would not the weight P descend, and the weight R ascend, and the wheel run on the line towards the weight F, which remaining stationary, would represent the fulcrum? Such is the result I had anticipated on a first view, but I have not tried the experiment;[2] the effect would certainly be such if the line *a* F was affixed to an immoveable object, as at H, or if the periphery of the wheel having teeth ran on cogs on the horizontal line. But restore the equilibrium by taking off the additional weight from P, and then add it to the weight R; the weights P and F both ascend, but there is no longer a lever, provided the wheel is prevented from coming in contact with the plane or road. Remove, however, the weight F, and affix the line to the immoveable object, H, or place cogs on the plane and teeth to the wheel, and you have a fulcrum or abutment (the term used is immaterial if the meaning is obvious); the force F H is now indefinite, and may be considered immoveable, and, as regards the others, has the same effect as a fixed point, though, in fact, it is a succession of fixed points, and the effect is, that the wheel moves, carrying the machine with it in the direction R. I need scarcely say, that in an actual experiment the lines must be coiled on the wheel to admit of its rolling.

Case 2.—*Power within the machine.—Locomotion.*

Let us now vary the case, so as to meet that of one where the power is within the machine, as in that of an expanding or contracting force, as steam power, manual strength, &c., or even a weight over a pulley. Here an enlarged view of things opens itself to a contemplative mind; but I shall keep within the limits of a rule that confines the question, and which is by some considered to be inviolable, namely, that it is impossible to employ any power within a machine so as to give it motion.[3]

Fig. 2.



Let the parallelogram, *m m*, represent a machine to be moved along the plane, A B, by a power within it; let the circle, C, represent the lever, as before, but the power represented by weight P = 1 being required to be within the machine; this will be effected by carrying the line over the pulley D, attached to or forming part of the machine. Let the weight *r* = 2, represent the resistance to the advance of the machine, or its tendency to retrograde, as in Case 1. Let also the weight F represent the friction or fulcrum, as before (of course, in case of experiment the real friction, if the parallelogram slide on a plane or rollers, must be taken into the account, and only such a weight used as will make the whole equal to the force calculated on, or 1; and this may be done by holding the machine steady, adding such weight at F as will hold P in equilibrio when carried over the pulley D.) The arrangement now will be similar to that in Case 1, in which the system was in equilibrio, as would be the case now if the weight P were acting from without the machine, but by carrying the line over the pulley D, and thereby bringing the power within the machine to be carried along with it; and the fulcrum of the pulley D be-

2. This is a ticklish point in theory, but it is of no consequence, it is *the point at which the grinding operation commences, and must be avoided.*

3. This is to avoid cavilling on the subject, but the fact mentioned by Trebor Valentine, which is an every-day one, and in which it appears a boat will be moved on the water by a person merely walking on it from head to stern, seems to me very much like an exception to the general rule here laid down.

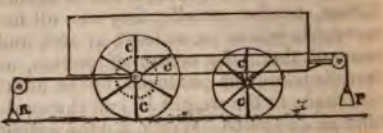
ing part of the machine, and also the point of action of the force or weight P, in the direction D P, and the re-action of the force D C in the direction D C, the sum of these forces will impinge on the machine in the direction of their resultant *d e*, but the force D P being in a direction perpendicular to the line of motion, does nothing. The force D C, however, being the re-action of F, and acting in the direction D C or C R, will urge the machine in that direction with a force = to F or P = 1.[4]

A question here naturally arises, What would be the effect if the power or weight P were increased? In practical application it would divide itself into two cases —the one of that of a locomotive moving on an inclined plane, and the other of one intercepted by an obstacle on an horizontal plane. In the former the resistance being that of gravity, and this a moving force uniformly continued, the load would descend the plane, carrying the power, be it what it may, with it, all that the additional power could effect being to drag the wheel and prevent its rolling. If the resistance be an immovable obstacle in the road, it becomes an abutment to the fulcrum, now removed to the centre of the wheel, and the grinding process goes on in proportion to the power applied; and, as Saxula says, the wheel may turn round, or the spokes be twisted out, but over the obstacle it will not go.

Let us before leaving this (but yet introductory) part of our subject, take one more case, and be it recollected, we are as yet but dealing with the theory of locomotion.[5] It is said the voussure of an arch will begin to slide at between 25 and 30 degrees of elevation to the horizon. Mr. Davy says, any arch may be turned to 30 degrees, without centering; let us say, then, that on a rough surface, as stone, the friction will present resistance, or bear a thrust, at 20 degrees, but say something less, and the force of gravity may be called one-third of the load on the plane, or, as our learned friend, R. C., would express it, L×. sin. i.[6] Supposing, then, a case in which the relative weight or tendency to descend, is one-third, we will proceed to

Case 3.—Let us, in this case, reduce the power-arm of the lever one-half, supposing the fulcrum at the centre, or one-fourth, supposing it to be on the plane; this will be done by representing the line to which the weight P is attached as coiled round the concentric circle CC (see fig. 3.) This will tell us something about

Fig. 3.



short and long cranks, and represent one at its maximum of effect. For the sake of the aliquot parts, call the weight of the machine 12 (whether lbs. cwts. or tons, the theorem will be the same); the resistance or tendency to slide down the plane (leaving out friction) will be 4. We have before assumed that the friction would sustain an additional thrust, so that it, or weight F, may be called $4+x$, x representing an indefinite quantity, or the force necessary to move the fulcrum. Now, the machine requiring a less force to urge it forward than what would move the fulcrum, the machine would locomote, provided a sufficient power were applied. To find this power, consider the fulcrum at the centre of the wheel, and inquire what power will be necessary to overcome the force F, supposing it only equal to R or 4? The principle of the lever tells us, that it will in this case require a power of 8 to hold the lever in equilibrio, and any addition to this will overcome the resistance, and motion will take place in the direction CD.

Here, then, we have an effective locomotion, capable of ascending a plane of between 19 and 20 degrees of elevation, but it is supposing it worked by a force continually acting in a direction parallel to the line of motion, and even then it will require a power of upwards of 800lbs. when the power is applied at half the distance it was in Case 2, or when the crank is equal to half the radius of the wheel, instead of extending it to its periphery;

4. The moving powers of the four weights in Saxula's diagram, at p. 472, vol. xv. are all equal, and they represent the effect of locomotive steam power; the weights 2 and 4, that of a cylinder working horizontally; and 1 and 3, in a vertical direction, the power being at its maximum point when a crank is used in each case.

5. *Should the theory pass muster, we will have something practical anon.*

6. See the apples of gold, p. 51; and for further explanation, p. 16, same vol.

whereas in that case it would require but 400 to hold the lever in equilibrio, so that long cranks do require less power to locomote (we are saying nothing about speed) than short ones.

I infer from hence that Saxula is right at p. 409, vol. xv. where he considers that the moving force is a maximum when applied in a tangential direction to the periphery of the wheel, at its vertex, and in a direction parallel to the line of motion, and supposing it impracticable to exceed this length on a common road.[7]

Should you think this simple method of treating the question any way tending to settle the controversy, I shall in my next endeavour to familiarise in the same kind of way the operation of the crank, stating some objections to its use; also the effect of the different positions of the cylinder, whether vertical, horizontal, or oblique, and its re-action on the machines, which re-action, in some cases, I conceive to be the moving power, &c.; mean time I remain yours truly,

HEZRON.

P. S.—I beg leave to inform Mr. Choerton, that in supposing the fulcrum of an oar to be on the side of the boat, he does not oppose *all* the authorities; Emerson says the pin on the side of the boat is the fulcrum. But as authorities do differ, we may say, "Who shall decide when doctors disagree?" Yet, after all, I think Saxula's idea of a struggle for the fulcrumship may have something in it, in some cases, particularly as we seem to have found out that there is such a thing as a shifting of the place of the fulcrum.

KENSINGTON OBSERVATORY.

Some years ago, the distinguished astronomer who, with a public spirit rarely equalled, established this observatory at his own expense, purchased on the continent the finest object lens, for a refracting telescope, ever made. The object glass presented to the University of Dorpat by the late Emperor of Russia, and which, in the hands of Professor Struve, has rendered such important services to astronomy, is one-third less in superficial magnitude, being only nine inches diameter, while that of Sir James South is eleven inches and eight-tenths. Soon after obtaining this valuable piece of glass, Sir James South determined on erecting a telescope to receive it, mounted in the manner of an equatorial, and placed in a building surmounted by a suitable dome. This work is now nearly accomplished.

The object class is nearly 20 feet focal length. The telescope is therefore above 20 feet long, and is furnished with two smaller telescopes, at either side, and having their axes parallel to the principal one. Such appendages, in large telescopes, are usually applied, under the denomination of finders, being intended to facilitate the process by which the observer directs the large instrument to any particular object. In the present case they answer this purpose, but they are also attended with far more important uses. Being instruments of considerable power, they enable the observer to effect, under similar circumstances of atmosphere and instrumental steadiness, three correspondent observations on the same object; or, as in the case of occultations of stars by the moon, three observers can witness the same phenomenon at the same time. The object glasses of these telescopes are exquisitely perfect, and are the work of Messrs. William and Thomas Sulley. One of these telescopes is 5½ feet focal length, and 4¼ inches aperture, and the other 42 inches focal length, and 2⅞ inches aperture.

The instrument is mounted by Troughton, in the manner of an equatorial, and, although so massive a structure, it can be moved with the greatest facility, both in right ascension and declination, by the observer, without removing his eye from the eye-piece. This is accomplished as usual, by two rods terminating in universal joints, and working small racks, by which the instrument is moved.

The building in which this splendid instrument is placed, is circular in its plan, being 28 feet 10 inches internal diameter in the clear. The circular wall is one brick and a half in thickness, and 11 feet 3 inches in height, from the floor of the building. On the wall-plate, at the top, is placed a circular iron railway, and on this rests a magnificient hemispherical dome. The dome revolves on the railway with an azimuth motion, that is, with a rotation round its vertical axis. This motion is obtained by six rollers placed

7. To Saxula.—Though S. will perceive I do not coincide with him in all points, yet I have in some degree taken up a cudgel in his defence, and though I have been somewhat tardy in so doing, still he will allow I have not stayed "till all commend." (Page 379, vol. 15.) I think he will also perceive I have given the subject some consideration, though, perhaps, not so much as himself. Should he feel such an interest in my opinion, *or view of the subject*, as to induce *a wish to open a correspondence with* me *on it, the editor has my address.*

on the above-mentioned railway, whereon the dome rests, and the dome is maintained in its position, and guarded against lateral disturbance by twelve guide-wheels, which are inserted on the outside edge in the circular plate which forms the base of the dome, and which press, as the dome revolves, against the upright ledge of the railway.

The dome itself is composed of extremely light ribs, which are thinly covered with cedar, protected by an external coating of copper. Its inner surface is lined with battens of pine.

To prevent the instrument, during observations, from being affected by tremors communicated to the walls of the building, either by moving the dome, or from any other external cause, the piers whereon the instrument is placed are altogether unconnected with the walls of the building.

To those who have not had the pleasure of witnessing the powers of this extraordinary instrument, it is not easy to convey an adequate notion of them. Under favourable circumstances it will bear a magnifying power of more than 1000, and even in bad nights one of above 700. Indeed, in observations on the fixed stars, there seems to be no other limit to the magnifying power which may be used with it, than the state of the atmosphere. The star of the first magnitude called α Lyræ may be viewed with a magnifying power of 5000 without losing in the slightest degree its roundness and distinctness.

Those who are conversant with astronomical observations will understand the excellence of the instrument from the following facts:—The close stars of δ Cygni and ζ Herculis, under favourable circumstances, are easily shown by it. The star ε Arietis is resolved into two stars instantly; and as for η Coronæ, ζ Caveria, and the second μ Bootis, they are shown as close double stars with as much facility as Castor is with ordinary telescopes. The division between the two rings of Saturn is still visible by its aid. Stars of the fifth magnitude may be observed with it in the day time. The small star which accompanies the pole-star has been seen with it under strong sunshine.

When powers magnifying several thousand times are used, an inconvenience arises from the circumstance, that the diurnal motion of the heavens is also magnified, and the star appears to run out of the field of view before the observer can contemplate it with the requisite attention. *To remedy this inconvenience, it is contemplated by Sir James South, to* connect the framing of the instrument with clock-work, by which the telescope will be made to move with the star; and thus, notwithstanding the diurnal motion, and high magnifying power, the object may be kept in the field of view for any length of time.—*Athenæum.*

MOTION OF FLUIDS—DENSITY OF METALS IN A FLUID STATE—EFFECTS OF CONGELATION.

Sir,—If your correspondent, G. L. L. p. 213, vol. xvi. has yet had an opportunity of referring, he must have discovered that for want of knowing what had already been written on the subject, his experiments have led him to draw conclusions respecting the currents, somewhat similar and quite as erroneous as the notions I set out with (see p. 21, vol. 14); but should he think well to repeat the experiments described pp. 312 and 463, vol. 14, I make no doubt he will agree with me in saying, they form as it were a nucleus around the upper end of the pipe, varying, however, in form and extent with the height of water above it. For the same reason he has also mistaken the purport of my letter, p. 107, the sole object of which was to prove the fallacy of the conclusions drawn by Venturi of the effect produced on the quantity of water discharged in a given time, by merely altering the form of the discharging pipe.

I am at a loss to know what G. L. L. means by supposing I spoke generically, not ambiguously; whether I spoke generically or not, I cannot pretend to say, but I must unequivocally deny any intention of expressing myself ambiguously. He says he knows of no similarity with water which is possessed by melted metals except buoyancy. He will please to observe that the only similarity I claimed for them, was fluidity, when in a fluid state; and that granted, it follows, of course, that while in that state they possess at least all the mechanical properties of a fluid, and so far must be governed by the same general laws. As it now appears, however, that I did not clearly explain myself, I will, with your leave, repeat the facts I wished to bring under the notice of your readers, which were simply, that as metals expand with heat, they must be specifically heavier in a solid than in a fluid state. It was there-

fore natural to infer that the solid could not be supported by the fluid metal; this, on experiment, I found true with lead, but not so with iron; for, as I before stated, the piece of cold lead sunk to the bottom, as often as raised to the top of a kettle filled with melted lead, and the solid piece of cast iron arose as repeatedly on being forced to the bottom of a ladle full of melted iron. I do not see any necessity for calling in the aid of either the affinity, or the power of adhesion in melted metals to account for a piece of iron floating in melted lead, as the power of gravity is alone quite sufficient.

G L L. next says—"I feel convinced melted iron will not support a solid piece of the same, or any other metal that can be brought to a state of fusion at a less heat than the melted iron possesses; but gold or platinum, I feel assured will remain on the surface, &c." Thus, he not only denies a fact, which though perhaps but little noticed, must be well known in every iron foundry, but in the self-same sentence we find his assurance diametrically opposed to his conviction, for although he is convinced melted iron will not support any metal that fuses at a less heat, yet, at the same time, he feels assured that gold, which melts with little more than one fourth of the heat that iron does, (and is moreover about two and a half times as heavy) will float on the surface! Wishing to know how far his assurance could stand the test of experiment, and not choosing to trust a sovereign in a ladle with melted iron, I procured some quicksilver, and laying the coin flat it floated, but from the increasing hollow which formed on the surface around it, I do not think it would have long continued to do so; I then placed it edgewise, when it instantly sunk to the bottom of the metallic fluid, although, as most of your readers know, the difference of the specific gravity of gold with that of quicksilver is but trifling, when compared with the difference between gold and cast-iron.

G L. L. concludes by stating—"The expansion of congealed water is owing to the air it contains, upon which also in a great measure its buoyancy depends." That this opinion may be currently received, I shall not dispute, indeed we have seen it ably supported in the pages of the *Mechanics' Magazine*; but, nevertheless, I must question its truth; for although I admit that water contains a portion of air, yet, unless it can be proved that ice contains a greater portion of air than an equal weight of water, or that air itself expands with cold, I cannot possibly conceive what it has to do with either the expansion or buoyancy of frozen water. I know it is argued, that the air which is combined with water is set free by congelation, when separate that they occupy more space than when combined, and that forming itself into globules, it becomes a recipient for the heat which is also liberated at the same time. Now, that air is set free by heat is clearly perceptible on placing a vessel of water over the fire, but where are we to look for proof that it is in like manner disengaged by cold? Were I to admit the bubbles seen in ice as sufficient evidence that such separation had taken place, the quantity is too insignificant to produce the effects generally attributed to it, even though it should expand to ten times the volume that could possibly ensue from any rise in the temperature of the atmosphere. Neither must we lose sight of the fact, that heat is evolved by the compression of air, and compression taking place in the act of freezing, that must be the moment of the greatest force of expansion; but, suppose the heat thus evolved, were for a time pent up in these receptacles, it certainly must and would be soon abstracted by the surrounding medium, when an alteration in the atmosphere even to summer heat, could never raise the temperature of these bubbles a single degree while they remain encompassed with ice. Further, as congelation commences at the exterior, it follows that the cold which occasions it, is naturally produced from the abstraction of heat by the circumambient air, and not by its being driven to seek refuge internally.

I am, Sir, yours respectfully,

TREBOR VALENTINE.

Derby, March 20, 1832.

IRON ROOFING.

Sir,—Your correspondent at Peterhoff (p. 46.) has not given you the best mode of covering an iron roof, to prevent its rusting. Coal tar, brought to 220 degrees of Fahrenheit, and mixed with red lead (genuine), in the propor-

tion of eight of tar to one part of lead, forms a composition which resists oxidation of the iron plate, or wrought iron of any shape, better than any other materials whatever. Oil, and every mixture of metallic oxides with oil, give a tendency to wrought iron, to scale off in large flakes when subjected to changes of temperature. At the present price of iron, it is much cheaper to cover a roof with sheets of that metal than with any other material whatever—and more especially where the plates are coated under and over with the above composition. Fine sand must be strewed on the surface, quite dry, and the work must be executed in dry weather.

Yours, &c.

A CONSTRUCTOR OF IRON ROOFS IN LIEU OF PAPER ONES.

BORING FOR WATER.

Sir,—Some time ago a wealthy native of Surat requested me to give him some information respecting the method of boring for water, as he wished to try the experiment on his own estate. I described to him the apparatus used; but, at the same time, gave him no hopes of succeeding in his project, in consequence of the flatness of the country—there being no hills near, which might serve as reservoirs for the water, and cause it to rise above the surface of the low ground. I have, however, lately seen, in some of the papers, that boring has been attempted, with success, at a distance from hills. If you, or any of your readers, can give some information on this subject, and answers to the following questions, I shall feel much obliged, as in this country, where irrigation is the chief expense in cultivation, it would be of incalculable benefit to the ryot, could he obtain a constant supply of water, without the trouble and expense of raising it, by means of bullocks, from wells and tanks.

Q. 1.—Is it probable that boring would succeed in a flat, sandy country, near the sea, but at a distance from hills?

Q. 2.—Would it probably succeed on a table land, 1500 feet above the level of the sea, with hills rising 1000 feet higher in the neighbourhood?

Q. 3.—At what depth is a constant *supply of water generally found?*

Q. 4.—Is it considered that there is an uninterrupted subterraneous communication between the water over a whole continent, or does it flow from separate reservoirs in the neighbouring hills?

Q. 5.—When water is obtained by boring, does it generally rise to a certain height above the sea, or to different heights in different places?

Q. 6.—At what depth (if water be not found) would it be advisable to leave off boring as a hopeless undertaking?

Any other information on the subject will be very acceptable,

Yours, &c. BENGEIR.

Bombay, Nov. 8, 1831.

ANSWERS.

Query 1.—The following extract from the *Examiner* of the 14th inst. supplies us very seasonably with an excellent practical answer to the first of the inquiries of our esteemed correspondent.

"In Egypt, an experiment has been made, which will, probably, have very important effects on the civilization of Egypt and Arabia. Two labouring men, who, we believe, had been employed near London in boring for water, were taken to Egypt by Mr. Briggs, who was at one time Consul at Cairo. They were employed under the patronage of the Pacha to bore for water in the desert. At about thirty feet below the surface they found a stratum of sand-stone; when they got through that, an abundant supply of water rose. The water usually obtained from the surface is of an inferior quality, and for many purposes useless; that which has been obtained by boring is soft and pure. We believe that the experiment has succeeded every place where it has been made. Already in the desert of Suez, a tank capable of holding 2000 cubic feet of water had been made, and it is probable, that by this time several others have been formed."

Q. 2.—Yes; though on a table land less probably than any where else.

Q. 3.—At various depths; as various as strata are in composition and arrangement.

Q. 4.—From separate reservoirs; an "uninterrupted subterraneous communication over a whole continent," does not seem at all likely.

Q. 5.—To different heights in different places—according to the pressure of the fountain head. We do not see any ne-

cessary relation between the height to which water rises and the level of the sea.

Q. 6.—Theory bids the borer never to despair; and practice has revealed, that people, for want of sufficient care and attention, often bore much farther than is necessary; that is, bore through the water into the sublatent strata.

We have volunteered these brief answers for the sake of conveying, as quickly as possible, to a far distant correspondent, some information on the points to which his inquiries are directed; but we do not profess to be practically familiar with well-boring, and hope some of those intelligent persons who are so, will take the wants of our Indian fellow subjects into consideration, and favour us with their remarks.—Ed. M. M.

LONDON STREET PAVEMENTS.

Sir,—Some years ago I addressed you on the subject of carriage-way pavements in the streets of London, pointing out the impropriety of laying down the square blocks of granite of so large a size, and the liability of draught horses to slip down on such roads. You did not publish my suggestions, but suffered them to lay forgotten.*

About a year before I sent you my short remarks on the subject, I took the pains to address the Commissioners of the City Pavements, and pointed out the remedy; but instead of attending to my suggestions, larger and larger blocks of granite have been used for the new pavements recently contracted for.

On Holborn hill, an attempt has been made to obviate the danger arising from the enormous size of the blocks, by picking or cutting them with transverse grooves. The new pavement had caused accidents without number, and at times, when dry, or nearly so, was almost impassable.

The remedy I proposed, was to lay down strips of granite, of equal depth with those now in use, but they were not to exceed from three to four inches in length, and to be of the like breadth. My reason for this is obvious: the step of a horse slips or slides back, until his feet at the toes finds footing in the interstice between the stones of the pavement. Let any one doubting this, look attentively when walking along the streets. Slipping aside where the pavement is rounded or bevelled off, would likewise be prevented by reducing the width of the stones; and this is, if possible, more dangerous than missing a step forwards; for who has not seen two or three horses thrown down together, by their coming in contact at the side with the feet of horses moving next to them?

Your correspondent of East Place, Lambeth, in No. 454 of your Magazine, may well say, "Is not this too bad?" And to what is this inattention to the wants of the public owing? To ignorance and jobbing! Strips of granite might be had at half the price of the regular squared blocks now used; but Mr. Pavior's bills would be sadly reduced, and those *scientific* men called Inspectors, would perhaps get *superannuated* by the appointment of one individual of real talent as surveyor.

I will not occupy more of your space than to say, that to Mr. Tidmarsh, your correspondent above named, you are indebted for my stirring in this matter once more. I despaired of obtaining any attention to this matter, although no less than thirty accidents happened in Skinner-street, Snow-hill, in ten hours, from this wretched mode of paving. But now the City Pavement Commissioners are paying masons for pecking and altering their slippery works, they will perhaps look to the first planning and execution of them.

One who works Horses in London Streets.

April 21, 1832.

* We have no recollection of the communication alluded to; but if it was as sensible and unexceptionable as the present, we ought to take shame to ourselves for withholding it from the public. As some amends for past neglect, we give immediate insertion to the writer's present letter, and shall be glad to be favoured with a continuance *of his correspondence*.—Ed. M. M.

Transfer of the Board of Audit to the Royal Society.—Sir, I take this opportunity to inform T. M. B. that it would be a most important benefit to the empire, were Mr. Hume President of the Board of Audit. Mr. Hume and Mr. Warburton are Members of the Royal Society.

It has been decided—triumphantly decided—that the parish accounts, which are, as compared to the national, of little importance, shall not be audited by a select vestry. The principle then is adopted as Sir John Cam Hobhouse told the assembled parishioners of Marylebone, on Monday last, "The smallest circle is as geometrically round as the largest."

The mere book-keeper knows nothing of either

naval architecture or fortification, which are two very considerable items in the public accounts. The Board of Audit may be assimilated to the Bankruptcy Court, which is an open Court,

4 Auditors.
6 Commissioners.

REVENUE.

1st Commissioner	-	Land.
2nd do.	-	Customs. Excise.
3rd do.	-	Miscellaneous.

EXPENDITURE.

1st Commissioner	-	Naval.
2nd do.	-	Military.
3rd do.	-	Miscellaneous.

I suppose that those officers should be elected by the Royal Society, rather than be selected by the principal Treasury Accountants.

I am glad your correspondent's attention is directed to this very important national subject, to whose care I assign it.—Yours, &c., T.—April 21.

London and Greenwich Rail-road.—We have been favoured with a copy of a Report, which has just been made by a Committee appointed to examine the surveys, plans, and estimates of this projected work; but it furnishes little information in addition to what we have already laid before our readers. The Committee state, that after a most careful patient, and minute examination of the surveys, &c., "they are fully satisfied of its practicability, and that it would be highly beneficial to the public, and profitable to those who may become proprietors." The railway is intended to commence between London Bridge and St. Thomas's Hospital, whence it will proceed in a straight line across Dean-street, Bermondsey-street, Parish-street, and Crucifix-lane, to a point south of Bermondsey New Church, and then, by a slight curve, to High-street, Deptford, and across the Ravensbourne to Greenwich. The length of the line will be about 3¾ miles, whilst that by the Old Kent-road is nearly five.

Spiral Tracers.—Sir, It was with considerable interest that I read the description of Mr. Henderson's helixgraph, in your last Number, seeing that I have myself been engaged for some time in maturing an apparatus for the same purpose, a description of which will be shortly forthcoming. Mr. Henderson's helixgraph is only calculated for the delineation of regular spirals; but I anticipate that with mine not only all the regular spirals, but also spirals expanding in any required ratio, may be described with great facility. I should like to know if any instrument possessing these capabilities has hitherto been constructed, and any information on this subject will oblige, yours respectfully, WM. BADDELEY. April 21, 1832.

Manufactory Schools.—In several of the large manufactories of Leeds, a plan has been adopted of establishing on the premises schools for the education of the children of those connected with the establishment. In the manufactory of Messrs. Marshall and Co., one hundred and twenty boys, and seventy girls, are receiving instructions as day scholars, in rooms purposely erected on their premises; and an extension of the accommodation is in progress, in order to meet an increase of scholars and improve their classification; the parents of the children contribute a moderate sum towards the expenses of this establishment. In the manufactories of Messrs. Hirst and Co., and of Messrs. Hinde and Co., masters are provided by the firms, who instruct the children who are employed both morning and afternoon, for which purpose stated intervals are allowed by the employers. These examples are likely to be followed; and cannot fail to be attended with *beneficial effects.—Journal of Education.*

LIST OF NEW PATENTS GRANTED FROM THE 20TH OF MARCH TO THE 20TH OF APRIL, 1832.

Thomas Gaunt, of Chapman-street, Islington, gentleman, for an improvement or improvements in gaiters or spatter dashes. Six months; to specify March 27, 1832.

Joshua Taylor Beale, of Church-street, Whitechapel, engineer, for certain improvements in steam engines. Six months; March 28.

John Howard Kyan, of South-row, Euston-square, Esq. for a new mode of preserving certain vegetable substances from decay. Six months; March 31.

John Bate, of the Poultry, optician, for an improvement or improvements on machinery applicable to the imitation of medals, sculpture, and other works of art executed in relief. Six months; April 9.

Alexander Beattie Shankland, of Liverpool-street, London, for a new method of spinning flax and hemp by means of machinery; communicated to him by a foreigner. Six months; April 13.

John Demeur, of Water-lane, Tower-street, London, gentleman, for a manufacture in the extraction of oleaginous matter from a certain foreign vegetable kernel, and the application of the said oleaginous matter to the making of oil, candles, soap, and other articles of commerce; a part of which invention has been communicated to him by a foreigner residing abroad. Twelve months; April 13.

John James Clark, of Market Raven, gentleman, John Nash, of the same place, tile and brick manufacturer, and John Longbottom, of Leeds, machine maker, for certain improvements in the machinery and process used in the manufacture of tiles, bricks, bread, biscuits, and other articles formed of plastic materials, a part of improvements is applicable to other purposes. Six months; April 13.

Richard Roberts, of Manchester, civil engineer for certain improvements in steam engines, and also in the machinism through which the elastic force of steam is made to give impulse to, and regulate the speed of, locomotive carriages. Six months; April 13.

George Edmonds, of Saint Mary's-square, Birmingham, gentleman, for a philosophic alphabet, or arrangement of letters, forms, or figures, by which the articulate sounds of languages may be scientifically denoted. Six months; April 13.

Benjamin Cook, of Birmingham, brass-founder, for an improved method of manufacturing various useful articles from a metal not hitherto used for that purpose. Six months; April 13.

INTERIM NOTICES.

The Supplement to Vol. XVI., with a Portrait, Engraved on Steel, of Baron Dupin, the Founder of Mechanics' Institutions in France, is now published.

Communications received from A. M. G.—Mr. Hounds—D. C. S.—Liberius—A Reader at Gosport—Enquirer—Alteram Partem.

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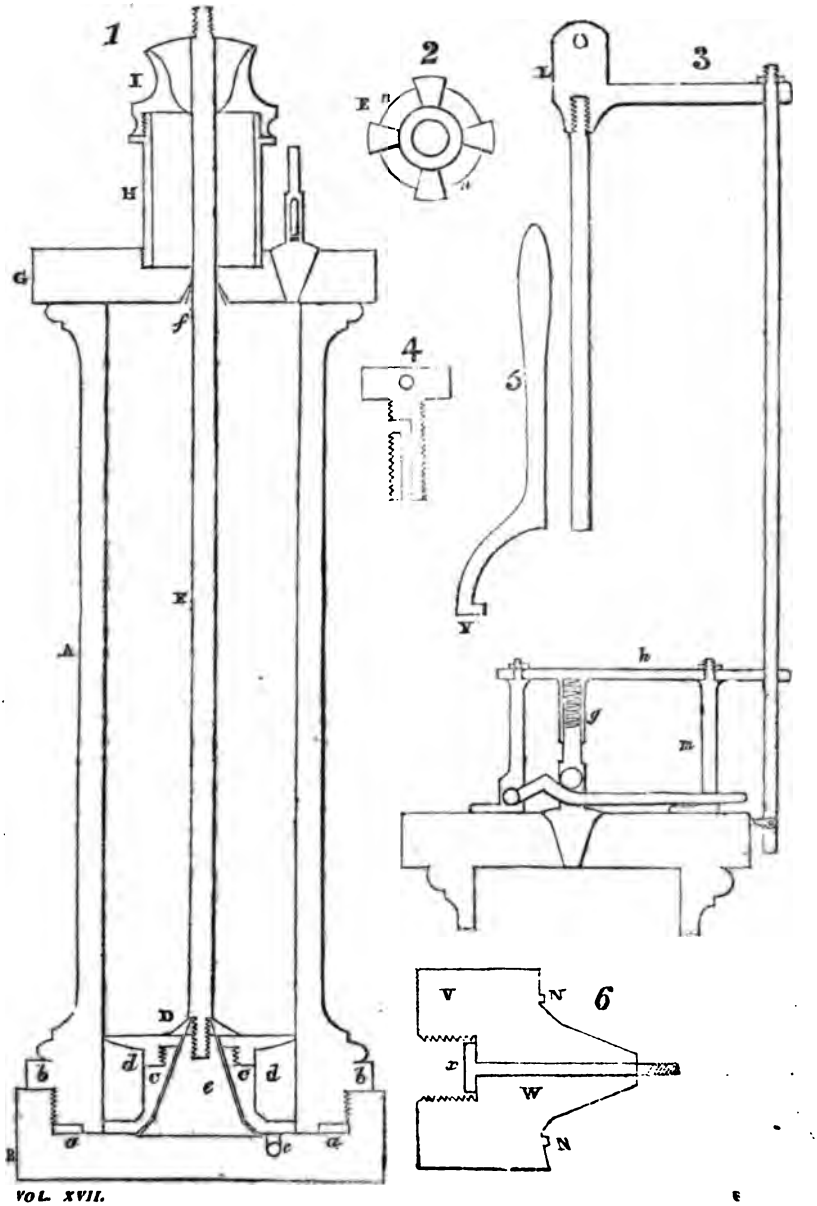
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 456.] SATURDAY, MAY 5, 1832. [Price 3d

IMPROVED DOUBLE-BARREL AIR-PUMP.



IMPROVED DOUBLE BARREL AIR-PUMP.

Sir,—My attention having been lately turned towards the improvement of the air-pump, and having nearly completed one upon a considerable scale, I take the liberty to send you the accompanying drawings with the following description, to which I hope you will give a place in your valuable publication. I am but an amateur mechanic, with, however, the advantages of good tools and leisure time. I employ two barrels, and, I think, the action of the pump will be found both simple and effective.

Fig. 1 represents a section of one of the barrels with piston and rod, box and oil cup complete. The valve in the top plate in that position, cannot be properly illustrated.

A is the barrel 10¼ inches, clear bore of 2½ inches diameter, and $\frac{1}{10}$ of an inch thick of brass.

B the pedestal, 4½ inches square and 1 inch thick, into which the barrel is screwed to the depth of half-an-inch. The end of the barrel has a channel *a* sunk into it, to receive a collar of elastic gum, which, on screwing down the barrel will secure the joint, and is preferable to oiled leather. The part next the channel, and also the shoulder *b*, are very accurately turned, so as to fit almost air-tight themselves. The aperture marked *c*, is a bore communicating to the pipe leading to the pump-plate; the connected joints will be seen in another of the figures hereafter described.

C the piston, consisting of two parts, screwing into each other for the purpose of tightening the oiled leathers which fills the space *d d*. The piston is 1 $\frac{1}{10}$ inch deep, and is bored in a conical form to receive the plug valve *e*, which is fitted very accurately, so as to be perfectly air-tight on being drawn up. The leathers are turned to fit the barrel, and in order to preserve as much as may be their elasticity, when the pump is not in use, I have widened a very little the bore of the lower part of the barrel for the space of an inch, which will relieve the leathers from being constantly under strong pressure, and ensure their due fitness when worked.

D is a steel collar screwing on to the piston rod, and forming a continuation of the brass cone of the plug valve—having *also four lugs, or ears, as seen in the larger drawing E, Fig. 2.* These lugs form portions of a larger cone, and serve to press down the piston when at the top of the barrel, acting on the face of the piston. The spaces between the lugs (*n*) permit the air to pass through the piston at the downward stroke, depressing the plug valve from its socket about the thirtieth part of an inch, which is sufficient to allow the air to expand itself into the barrel without any resistance.

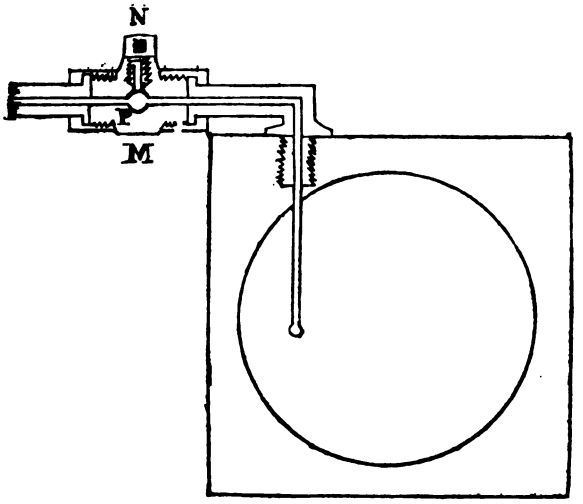
F the piston-rod, say $\frac{4}{10}$ inch in diameter, of shear steel, very accurately turned and polished, screwing at its lower end through the steel collar D, and into the plug valve *e*, both of which were turned true upon the rod.

G the top plate, forming a circle of 4¼ inches in diameter, and half-an-inch in thickness, with a screw part $\frac{4}{10}$ of an inch deep screwing into a channel cut in the top of the barrel. In the bottom of the channel is placed a collar of elastic gum, which, receiving pressure by the screw, makes the joint secure. In the centre of the top plate *f* is turned a conical hollow to receive the cone of the steel collar, and a small part of the plug valve with channels also cut for the four lugs, so that on the piston being drawn up, the top (ground very true) strikes the under face of the top plate, which is turned as true as possible, so as to admit of the closest contact. The air will thus be discharged through the upper valve so nearly as only to leave the minute portion that will remain betwixt the faces of the lugs and that of the piston, and they having only about the area of one-tenth of an inch, while the space betwixt them and the piston is only the thirtieth part of an inch, the disadvantage may be said to be inconsiderable when the great area of the barrels is taken into account. The action of the piston is simple, as the operator has only to ascertain that it comes into contact with the top plate, which will determine itself and be confirmed by the falling of the valve, provided the lever be properly adjusted. It is not *necessary* that the piston should reach the bottom of the barrel.

H, the stuffing-box filled with collars of oiled leather, screwed down tight by the oil cup I. The box is 1¼ inch inner diameter, and 2 inches high, and allows room on the top plate for the discharging valve to work direct into the barrel.

K, the discharging valve—fitted very accurately, and having a mortice cut

Fig. 7.



through the stem to receive a friction roller and the working lever, as shown in fig. 3. The smaller part of the stem is fitted into a guide socket (*g*) in the frame (*h*) so as to ensure its vertical action, having an elastic wire to return the valve smartly, at the instant that the face of the piston touches the top plate. In this sketch nothing is shown but the valve and its appurtenances. It is worked by a wire rod, fixed to the head of the piston rod by an arm, and has a hinge which lifts the lever on the rise, and passes over it on descending; the lever works in a mortice in the pillar (*m*). L, shows the piston rod, head, and arm for the lever wire. The rack is attached to it by a steel pin; and the piston rod, when screwed into the head, is secured by a pin from the possibility of getting loose, and thereby deranging the working of the piston valve collar.

Fig. 7 is a plan of one of the pedestals, showing the mode of communication with the pump-plate pipe. The part M is screwed by Smeaton's union joint to the angular pipes screwed to the pedestals. N is a stop screw, shown on a larger scale, fig. 4, as given by your correspondent, S. K., No. 349, vol. 13. The bore P leads to a neck, into which is inserted the pipe leading to the plate. The joints are all secured by collars *of elastic gum.*

The *pump plate is 9¼ inches* in diameter, and I use the stop-cocks with stuffing boxes, as suggested by S. K. The rotary motion proposed by your Exeter correspondent, H. I., No. 244, vol. 9, appears to me to be objectionable as not being sufficiently controulable, and as having the encumbrance of another wheel, and a greater length of racks. I prefer the wheel and racks (with epicycloidal teeth) and a lever with two handles. The barometer and syphon guages are attached in a more simple manner than Cuthbertson's.

Fig. 6 is a section of the chuck I use for screwing tight the piston leathers, and turning them in the lathe.

V, is the chuck, of hard dry wood, with a screwed socket for the mandril. Through the centre is put an iron bolt *x*, a little squared, so as not to turn round, the outer end tapped to receive a nut. A cone W, is turned to fit exactly into the piston, and two small brass pegs (N) are inserted outside the base of the cone to fit into corresponding holes drilled in the bottom of the piston, to prevent its moving when screwed up. A sufficient number of leathers are then screwed tight, and a wooden washer, turned true, is put next the face of the piston previous to screwing on the nut, which keeps it firm enough for turning. Two holes are also drilled in the strongest part of the piston face to receive the prongs of a

key, made for the purpose; which holes are afterwards filled up by a hard cement flush with the face.

Fig. 5 is the form of the key used for most of the screwed joints, and varies in size accordingly.

The pin Y is inserted in a hole drilled into the part; for instance, into the edge of the top plate at G, or of the barrel at the shoulder (*b*).

I have been thus minute in my description, as knowing the value of such notices to amateurs like myself, and which your better informed correspondents will treat with indulgence. If you think this worthy of a corner of the Mechanics' Magazine, I shall take the liberty of informing you how the pump succeeds when completed, which I hope to accomplish very soon—when, perhaps, some of your ingenious correspondents may favour me by expressing an opinion upon it.

I am, Sir, one of your earliest Subscribers, and (to use a well-worn expression) your constant read e,

R.

Halifax, Feb. 6, 1832.

MATHEMATICAL DEMONSTRATION OF THE CORRECTNESS OF LIEUT. DRUMMOND'S PRINCIPLE OF REPRESENTATION.

Sir,—About two months ago a certain nobleman sent for me, and requested an algebraical solution of the following question:—

Suppose the population of England, Scotland, and Ireland, to be A, B, and C, and the amount of taxes paid by each country to be *a*, *b*, *c*; how many Members ought each country to return to Parliament (D being the whole number) taking into account the joint ratio of population and taxes, and give the result in numbers; supposing A, B, C, to be 13,89400, 2,365000, 7,734000, and *a*, *b*, *c* = £43,258990, 5,113353, 4,392101, and D = 658?

I mentioned to his Lordship that Lieutenant Drummond had explained how the question should be solved; adding, that, although I had never seen an investigation of his method, still I was convinced it was impossible for that young but able mathematician to err in principles. His Lordship candidly admitted, *that he did not fully understand the Lieutenant's method; and that he himself had solved the question,* but the results were not the same as those obtained by the Lieutenant's method. But "give me (said his Lordshop) a plain solution of it, according to the laws of common sense; and if it shall agree with that deduced from the Lieutenant's method then I will own myself in error." Next day I presented his Lordship with the following solution:—

Assume that $A+B+C=S$ and $a+b+c=s$; then $S : A :: D : \frac{AD}{S}$ = number of Members, England ought to return, if population only forms the basis of importance; and $s : a :: D : \frac{aD}{s}$ = number when taxes only form the degree of importance $\therefore \frac{1}{2}\left(\frac{AD}{S}+\frac{aD}{s}\right) = \frac{D}{2}\left(\frac{A}{S}+\frac{a}{s}\right)$ = number England should return, according to the joint ratio of population and taxes. In the same way the respective numbers for Scotland and Ireland will be $\frac{D}{2}\left(\frac{B}{S}+\frac{b}{s}\right)$ and $\frac{D}{2}\left(\frac{C}{S}+\frac{c}{s}\right)$ and restoring the values of A, B, C, *a*, *b*, *c*, and D, the number for England will be 460¼, Scotland 64½, and Ireland 133¼.

His Lordship had some misgivings about the accuracy of the principles of the above solution, arising apparently from the employment of a geometrical instead of an arithmetical mean. Two days after, I therefore, sent his Lordship the following additional solution, which will be found to agree exactly with the above:—

Second Investigation.

Using the same notation as before, let *i* be the value of importance of an Englishman, a Scotchman, or Irishman $\therefore \frac{a}{A}+i$ will be the value of importance of an Englishman in point of population and taxes. Hence the whole importance of England in these two respects will be $A\left(\frac{a}{A}+i\right) = a + Ai$; and for the same reason $b + Bi$ and $c + Ci$ will be the respective importance of Scotland and Ireland. Hence $a + b + c + i(A + B + C)$ or $s + Si$ will be the united importance of Great Britain and Ireland. Consequently, $s + Si : a + Ai :: D : D\left(\frac{a+Ai}{s+Si}\right)$ = number

England should return, and $D\left(\frac{b+Bi}{s+Si}\right)$ and $D\left(\frac{c+Ci}{s+Si}\right)$ will be the numbers for Scotland and Ireland. It now only remains to assign a proper value for the arbitrary quantity i. Now, let it be remembered that, in point of importance, we have supposed that an Englishman, a Scotchman, and an Irishman, are each of the same value ∴ the only value that we can rationally assign for i is the quotient produced by dividing the whole amount of the taxes by the united population, that is, $i=\frac{s}{S}$. Hence by substitution $D\left(\frac{a+Ai}{s+Si}\right)=D\frac{\left(a+A\frac{s}{S}\right)}{2s}$ $=\frac{D}{2}\left(\frac{A}{S}+\frac{a}{s}\right)$ the same as in the first solution, &c.

His Lordship, after trying the effect of other values for i, at last fairly acknowledged that no other rational value could be assigned for i but $\frac{s}{S}$; and, concluded his Lordship, it is but fair to allow, that "A man's a man for a' that."

I am, Sir, yours with respect,

GEORGE SCOTT,

Professor of Mathematics.

9, Great Quebec Street, Montague Square,
May 1, 1832.

CORRUPTIONS OF THE ENGLISH TONGUE.

Sir,—I did not anticipate that my letter (written on January 20th, and inserted on March 31st) in the Mechanics' Magazine, on the Corruptions of the English Tongue, would have led to any occasion of again addressing you. A learned Theban has, however, taken up the cudgels on the side of the corruptionists, in the columns of a weekly review called the Literary Guardian, and attempted to bolster up their cause with divers apologies for arguments, and that withal in so confident a style, that I really must trespass on your indulgence once more, and give the poor man the good sound drubbing he deserves. It is true, he seems to have been, in the very moment of perpetration, rather afraid of punishment for his presumption, and *therefore edges* in a sort *of half-compliment to the* Mechanics' Magazine at the same time; attributing its insertion of the letter in question to an "over-anxiety for popularity." Popularity indeed!—as if the other side were not, unfortunately, the more popular of the two, and as if it did not require a sort of chivalry on the part of an editor, now-a-days, to admit of any communication attempting to stem the torrent of unmeaning verbiage which threatens to "swamp" our language. The idea is worthy of the article which it commences, and only to be surpassed in absurdity by the "argument" which follows.

This is one of mine adversary's "great guns;" and, as might be expected from an advocate of corruption, is ridiculous on the very face of it. Only think of an animal of any pretensions to rationality asking the question, "Why is the English language not the language of England?" He might as well have asked, "Why is the writer of the paper in the Literary Guardian, on Scientific Nomenclature, *not* an ass?"—and the reply would be much the same in both instances. Only think for a moment of the stupidity of the idea, that because the English language is partly composed of words from foreign sources, it is therefore not "the language of England." And only think again of the ultra-stupidity of the other notion, that because, when the English language was in process of formation, our ancestors borrowed some words and phrases, expressive of new ideas, from the neighbouring nations, we are to go on "dragging in" words and phrases from any tongue on the face of the earth, although we may have terms quite as expressive of the idea, or more so, in the "pure well of English undefiled." Cannot I as well say that this notion is sheer "nonsense," as borrow a word from the Irish, and brand it as "blatherumskate?" Is it not as well to call an idiot "an idiot" at once, as to entitle him a "Lit-Ree-gah-diang," which, for aught I know, may be the Chinese for that indispensable word? Is an English serjeant of grenadiers, if he pleases, to give the word to his men, "shoulder *tic-tic-boos*;" and then, if they do nothing, have them flogged for disobeying orders, because they ought to have known that "tic-tic-boo" was Sandwich-islandish for a musket, and, being Sandwich-islandish, was of course English, as soon as he chose to make it so? In fact, would the men be flogged, or the sergeant sent to Bed

lam? Yet his defence would be complete, according to your learned contemporary. Our ancestors borrowed from other languages,—*ergo*, we may borrow at will from Sanscrit, or Hindostanee, or Cheskian, or Gaelic, or Timbuctooan,—aye, from the language of George Psalmanazar himself! Boh!*

But then it seems I am a sinner against my own doctrine, because I do not refrain from the use of words derived from foreign sources. In answer to this, it is only necessary to ask, Where I ever condemned the use of such words, provided they were necessary to express an idea for which there was no *native* word? The example of Dr. Johnson, indeed, it is to be lamented, has served to naturalize an immense number of unnecessary words of Latin and Greek derivation, insomuch that it is now scarcely possible to avoid them. Thus, in my letter, I made use of the long verb "accelerate," when the good old English one "quicken" would have done at least as well; yet my taker-to-task has passed over this glaring crime, and spent *all* his *wit* (!) in trying to raise a smile, by proposing queer out-of-the-way compounds as substitutes for the foreign-derived words, in the letter which has so terribly raised his bile. He does succeed in making his readers laugh; but then, unfortunately, it is at his own expense. Thus, he inquires, why I did not write "mite-club-each-ion," instead of "subscription;" as though the Latin words from which it is derived expressed any such thing as that the subscribers clubbed each a mite. We have an English word compounded in exactly the same way, "underwriters;" but that is used in one sense, and "subscribers" in another,—and why not? The respective meaning of both is well established, and well known; but that is no more a reason why English should be further Latinized, than the circumstance of the Literary Guardian having been raised a penny in its price, one week, is a reason that it should be raised a penny every week. We must stop somewhere; and if the English language is to continue to be Latinized (not only Latinized, but Greekized, Germanized, and Asiaticized), it must soon be what the Literary Guardian would be, if its price were continually raised —one of the *has-beens*. To prove that I have not at all "stretched" this *argument* of the pro-corruption writer, I shall just quote a short sentence of his:—"Seriously (?) speaking, the mystery of language is a mystery to those only who seek to mystify, and then nothing is more easy than to puzzle and to be puzzled." How oracular! Pray, Sir, do you *seriously* mean to say, that all languages are *equally* simple, *equally* expressive, *equally* full, and *equally* clear? If not,—if there is really some difference between the language spoken by the King of England and the mother-tongue of old King Cudjoe of Jamaica, and if one of these is superior to the other,—may not the English language undefiled, be a different thing from the English language *ad libitum*; and may not one of these be the superior? Again, do you seriously mean to assert, that the Sanscrit language, for instance, is a mystery only to those who seek to be puzzled, and that any one, if he chose, might learn it as easily as the French? If you do not, you admit, that one language *may* be more complicated, more "mysterious" than another, and your argument is smashed at once, "all to *smithereens*:" I leave you to pick up the tatters. If, indeed, you *seriously* mean to assert, that it is of no consequence whether a mechanic should "enter the portals of philosophy" at once, or pore for seven years over the Sanscrit of science, you have still a leg left to stand upon:—but *not otherwise*.

Now then, for a return fire to the other "great gun,"—the case upon its merits,—the *bona fide* defence of scientific nomenclature, on which I must be brief. "When a new substance, not compounded of other known substances, is discovered, it becomes necessary to give it a name, which is generally so formed as to express some one of its distinguishing characteristics." Very good! Now for an example:—"Thus, the word *iodine*, coming from a Greek word, signifying *violet*, is given to a substance, which when slightly heated, is converted into vapour of a beautiful violet colour." Well, what of all this? Why resort to the Greek? The word after all only gives a distant clue to the "characteristics" of the substance in question,—it does not express in three syllables the sentence "substance, which when heated, becomes of a beautiful violet colour," or any thing of the kind; but

* This expressive monosyllable is intended for *the private ear of the writer of the Literary Guardian article alone.—(Vide anecdote of Ben Jonson.)*

simply "violet-like." Why not then use the English compound? Simply, it seems, because it would so awkwardly combine, would be so gnarled a *root* for its derivatives. This objection, would however, be removed by adopting the termination of the Greek-derived name, and calling it "violetine:"—this would make "violetide," as easily as "iodine" would make "iodide," and so on through the whole chemical gamut. The *only* difference would be, that when the word was mentioned, its characteristics would be remembered at once, while as the matter stands, the mind has to go through the process of recollecting that the word comes from the Greek, and that "ion" is Greek for violet; and where is the great, the indispensable necessity for going thus round about, when a short cut is open before you? It is the same with the other instance adduced: I should no more think of saying "water-generator," (how *English*, by the way!) than a chemist would of saying "*hudor-genomai*," the two words from which we are informed "hydrogen is derived: but why not name it "watergen" at once, and thus give some idea of its nature and properties? Any thing is better than making use of "crabbed Greek"—the great vice of the chemical nomenclature, which is perhaps, after all, not quite so bad as that of some other sciences. Geology, for example, is, that its roots are not taken from the mother-tongue. If Greek terminations make better compounds than English, they may be reluctantly allowed, but it is absurd to insist upon calling that which is known to all as "water," by the name of "hudor." Geology bears off the palm of absurdity, because it is not content with one or two languages, but lays all under contribution, that come in its way.

But we are to "rest assured, that when two or more ideas are to be combined in a name, a whole sentence of English explanation must be tied together, where one word of two or three syllables, derived from the Greek, will answer the purpose infinitely better." I, for one, shall "rest assured" of no such thing. Pray, what ideas are conveyed by the term "iodine," that are not by the English one "violet-like?" What does the Greek "hydrogen" express more than the English "water-maker:" does this pretty pet-term "hydrogen," give the whole properties of the "substance *which, in combination* with oxygen, produces water?" No such thing, it expresses just as much as the English compound I have given, which I humbly hope is not exactly "a whole sentence of English explanation tied together." It is not meant to be denied, that the Greek language possesses very great facilities for combination,—but then so does the English. Where have the Greeks any words at once so expressive of the substance, and its peculiar properties or uses, as our compounds "sea-water," and "walking-stick." Because they cannot coin combinations so nicely-expressive as these in their own language, would the learned Theban of the Guardian *seriously* advise the Greeks at once to incorporate in their vocabulary the elegant, and (to them) doubtless very significant terms "sea-wateros" and "walking-stickos?" After all said and done, I do not think so meanly of his intellects as to suppose him capable of running into such an absurdity *with his eyes open.*

Now for a word as to the little after-objection, which slides in just at the end of the article: I am behind the statute of limitations, forsooth, in my "attack," because many of the words I "anathemize," are to be found in Johnson, who, it seems, is an "undoubted" authority. Some of the words, very likely, may be found in the Doctor's bulky tomes, although even he, I think, does not admit as English such words as "debris," or "operative," (as a noun, meaning a "workman,") both of which I "anathemized:" if he does, that is small consolation. It is quite new to find the Doctor quoted as a perfectly "undoubted" authority: many, very many, have condemned the extra latinity of his own style, and the system upon which he proceeded in compiling his great work, of admitting any word once used by an English classic, even if only in the way of half-quotation—(oh! that he had lived in our days of French-English novels)—precludes the idea of its being safe for the English student to take him for an "undoubted" authority. I thought, too, one John Horne Tooke (an obscure writer on *Philology*) had taken occasion most impudently to doubt the worthy doctor's "undoubted authority," and had carried no inconsiderable number of disciples in his train. To finish the dispute, I would undertake, in any given hour, to rummage from the columns of the Doctor's

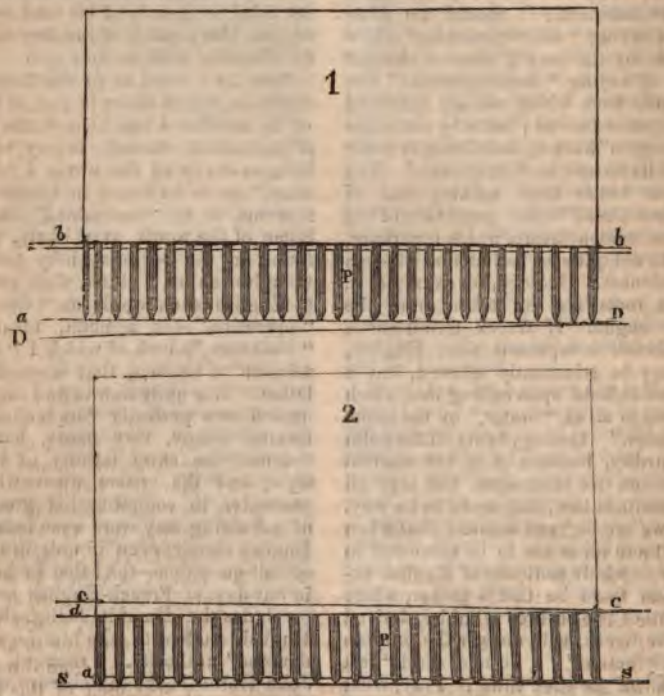
"big book," at least a hundred "langnebbit words," which never were, and, it is to be hoped, never will be, English.—"So much for Buckingham!"

I have already wasted more ink and paper than I intended, on an unworthy subject, so I shall pass over the bootless assertion, that chemistry requires only about fifty "roots" for all its combinations (when it is well known that every *manipulator* tries to hand his name down to posterity by tacking it to some newly-discovered substance, without rhyme or reason; and there are more than fifty such)—the strong, unanswerable argument, that we must not grumble that the language of music is Italian, and of dancing French (although we are not told *why* we must not)—the profound remark, that the English Dictionary contains a myriad host of words (as if that were a reason for adding twice as many more myriad hosts to them)—and another little crudity or two. I have not been sparing, Mr. Editor, in this my answer to an unprovoked assault; but then you must recollect I have been *hotly* attacked. I have now a favour to beg—the sooner my unfortunate opponent is put out of his misery the better; I hope, therefore, that this letter will not have to wait so long for insertion that he may have any cause to think he remains master of the field.

Yours, &c. F. H.

2d May, 1832.

NEW LONDON BRIDGE—SUPPOSED CAUSE OF THE IRREGULARITIES IN THE LEVELS.



Sir,—It appears from a Report which I have just seen, made to the New London Bridge Committee by Messrs. Telford and Walker, that they cannot positively say what is the real cause of the difference of level that exists throughout the whole superstructure, the east side of the bridge being considerably lower than the west; but that they incline to the opinion, that the present state of things is owing partly to the foundations not having been laid quite level, but princi-

pally to a settlement afterwards. Will you be pleased to take my humble opinion on the matter?

Fig. 1 is a supposed transverse view of one of the piers of the bridge. P, the piles, driven through loose rubble, or some other substance not strong enough to carry the structure. DD, the surface of a strong bed of clay or marl, quite strong enough to carry the weight that is upon it. I will suppose the mason-work to have been laid at first on the top of the piles P, level, or nearly so, the whole length of the piers; then that as the weight accumulated upon them—probably after the centres were struck—the piles at the west end of the piers would sink but little, if any thing, from resting upon the strong stratum of clay, but by reason of the inclined surface of that stratum, every succeeding pile to the east end of the pier would have farther to sink till the whole fabric would settle down to an inclination corresponding with that of the solid clay. If there were any steps or holes full of rubble, or some loose matter in the clay, some of the piles to the east might have gone down below the regular inclined surface of the solid stratum, and fractures in the piers would, under those circumstances, have been the necessary consequence; but as no fractures appear, I have no doubt but the bridge rests as firm as a rock. I cannot, for a moment, suppose that such excellent workmen as must have been employed in building the bridge, with a plumb-line in their hands, would ever have raised such a structure without observing that the bridge eastways would overhang its base. The irregularity must certainly, therefore, be attributed to a regular settling down upon the inclined solid stratum. Thus, London has her hanging-bridge as well as Pisa her hanging-tower; and both from the same cause.

In figure 1 from *a* to D, shows the distance the pier had to settle, D being the surface of the inclined solid stratum; *b b* is a line level with the top of the piles, as originally inserted.

Fig. 2 shows the pier, sunk from *a* to the line S S, resting upon the solid stratum. From the line *c c* to *d*, fig. 2, shows the distance the piers have gone down at the east end.

Yours, &c. THOMAS DEAKIN.

Blaenavon Iron Works,
Dec. 12, 1831.

SILK FROM SPIDERS.

In the early part of the last century the attention of the Royal Academy of Sciences, at Paris, was called to a memoir of M. Bon, of Montpelier, on the silk which he obtained from the bags in which the common house spider deposits its eggs. These bags were carded, and spun into thread; and a few small articles, such as gloves and stockings, were made of it, rather as objects of curiosity than of use. The further investigation of the subject was committed, by the Academy, to M. Reaumur—who, after many trials, gave it as his opinion, that this kind of silk could never be worth collecting, on account of the small quantity yielded by each spider—its great inferiority in lustre to that of the silk-worm—the impossibility of making the spiders live in quiet with each other—and the great difficulty of providing them with suitable food.

The project of obtaining silk from spiders, lay accordingly abandoned for several years. Very recently, however, it has been revived by Mr. D. B. Rolt, of Friday-street, London, who has made a communication on the subject to the Society of Arts; for which they have been pleased to award him their silver Isis medal. The species of the insect to which Mr. Rolt has turned his attention, is the common garden spider (*arena diadema*), the webs of which, in autumn, are so conspicuous on the surface of shrubs, and in other similar situations. On allowing one of the animals to crawl over his hand, he found that it drew a thread with it wherever it went; he likewise, without any difficulty, wound some of this thread over his hand, finding that the spider continued spinning while the thread was winding up. On this hint he connected a small reel with the steam-engine of the factory in which he is occupied, and putting it in motion, at the rate of 150 feet per minute, found that the spider would thus continue to afford an unbroken thread during from three to five minutes. A specimen of this silk, which accompanied Mr. Rolt's communication, was wound off from twenty-four spiders in about two hours. Mr. Rolt estimates its length at 18,000 feet; its colour is white, and its lustre is brilliant. No attempt has been made by him to combine two or more filaments

into one by winding, nor of course to form it into thread by throwing.

The thread of the garden spider is so much finer than that of the silk-worm, that the united strength of five of the former is, according to Mr. Rolt, equal only to one of the latter. And as he has not been able to devise any means of overcoming the pugnacious disposition natural to the animal —so much so, that to prevent his little labourers from destroying each other, he is obliged to shut them up in separate dens or cells—the subject cannot be considered as much, if at all, advanced, by his experiments, beyond the point where M. Reaumur left it.

FRENCH AND ENGLISH STATISTICS.

1.—*Cultivated and Uncultivated Lands in the United Kingdom.*

	Cultivated acres.	Uncultivated wastes, capable of improvement.	Barren and unprofitable.	Total.
England - -	25,632,000	3,454,000	3,256,400	32,342,400
Wales - -	3,117,000	530,000	1,105,000	4,752,000
Scotland - -	5,265,000	5,950,000	8,523,930	19,738,930
Ireland - - -	12,525,280	4,500,000	2,416,664	19,441,944
British Isles - -	383,360	166,000	569,469	1,119,159
Total - - -	46,922,970	14,600,000	15,871,463	77,394,433

In England and Wales it is calculated that there are:—

3,250,000	acres employed	in the cultivation of wheat.
1,250,000	-	in that of barley and rye.
3,200,000	-	- oats, beans and peas.
1,200,000	-	- clover, rye-grass, &c.
1,200,000	-	- roots and cabbages, cultivated by the plough.
2,100,000	-	- fallow.
47,000	-	- hop grounds.
18,000	-	- pleasure grounds.
17,300,000	-	- depastured by cattle.
1,200,000	-	- hedge rows, copses, and woods.
1,300,000	-	- ways and watercourses, &c.
5,029,000	-	- common and waste land.

37,094,000 acres.—Total of England and Wales.

The number of farms in the United Kingdom is estimated at 2,000,000, and the property annually derived from agriculture to Great Britain and Ireland, at £216,817,624.

2.—*Comparative Consumption of Bread in London and Paris.*

From an official statement, as to the quantity of flour sold, and prices of bread in Paris, during 1830 to 1831, it appears, that in 1830, at the Corn Exchange in Paris, the sales of flour were 262,449 sacks of 159 kilogrammes, equal to 356½ lbs. English cart sack; and the price of the best wheaten bread varied from 7¼d. to 8¼d. the 2 kilogrammes, or 4 lbs. 6½ oz. English; and in 1831, to 194,596 sacks; while the assize of bread ranged from 7¼d. to 8⅔d. the 4 lbs. 6½ oz. The consumption of Paris is estimated at 1,800 sacks of flour per day, or 657,000 sacks per annum. The sales at the Corn Exchange, therefore, amount only to about one-third of the total of what is consumed in the French metropolis.

In London, the consumption is calculated at 3,500 sacks of flour per day, among a *population amounting to 1,474,000*; in Paris, at 1,800 sacks of 159 kilogrammes, equal

to 2,990 English sacks, among a population of 730,000; so that in Paris, they consume daily 569 sacks more in proportion than in London. We have been paying during the above period from 8½d. to 10½d. per 4 lbs. of bread. In Paris, 4 lbs. 6½ oz. were obtained for from 7½d. to 8½d. Thus it would appear, that taking into consideration the value of the currency in France, as compared with that of England, that bread has been maintaining in Paris a higher ratio of cost price.

3.—*Consumption of Animal Food in Paris and in London.*

In London, calculating the population at 1,400,000, it appears that the annual consumption of each individual is 155 lbs.; and reckoning the population of Paris at 750,000, it is found from the accurate reports of M. de Chabrol, that the annual consumption amounts only to 86 lbs. individually.

T. H. B.

NATURE OF COMETS.

Mr. Editor,—Much has been said on the subject of comets, by those who stand high in the opinion of the public for their general astronomical knowledge, yet, as this is a subject more of speculation than demonstration, and as I have not met with any theory which has been satisfactory to my own mind, permit me to suggest the following thoughts to the consideration of your numerous readers.

I assume, in the first place, that fire is the great medium which God has appointed for the purification of all vegetative matter—hence I conclude, that a comet is nothing more nor less than a globe which has stood its appointed time, and is actually undergoing that state of purification by fire to which we know our own, in its turn, is fast approaching. As an argument in favour of this idea, I would ask, what will be the probable appearance of our earth at that grand and solemn period, if viewed from some distant globe?—I answer, exactly similar to that of a comet when seen by us from this globe on which we dwell.

In order to illustrate this more clearly, I would observe, first, that all opaque bodies, like our earth, can receive the rays of the sun on that half part only which stands next towards that great luminary, leaving the other half part in proportionate darkness, producing a shade or shadow which extends to an immense distance, in proportion to the magnitude of its body and distance from the sun.* In the next place I would observe, that it is a known fact, which daily experience teaches, that the sun's rays are at all times too powerful for any fire, however large, to be seen many miles from its known situation in the middle of the day, or when it lays exposed to its omnipotent beams. It is nevertheless true, that where fire is not thus exposed to the rays of the sun, or when it takes place in the night, that fire may be seen at an immense distance, and the atmosphere will appear illuminated to a considerable height. These are facts which I think require no proof; and if they be admitted, then no person can reasonably expect to see the effects of the conflagration from that part of the globe on which the sun shines, but from that part alone which the sun leaves in darkness—and its illuminated shade or shadow (in the form of a cone) is exactly that which we behold, and which we denominate the tail. Now, as the tail of a comet is always seen in an opposite direction to the sun, this exactly corroborates with the views I have given on the subject; and I think any one must perceive, that it is impossible for the cone or shadow to appear in any other direction than in opposition to the sun.

The above view of the subject, in my opinion, reasonably accounts for the following particulars relative to the phenomena of comets:—

First.—Why the course of a comet is different from all other globes:—Because the laws of gravity and attraction, to which it had formerly been subject, are greatly disturbed and altered by the medium of fire.

Secondly.—Why comets do not always appear globular:—Because it being of itself an opaque body, similar to our earth, the moon, &c. receiving the sun's rays on that part only which stands next

* The dark shade or shadow arising from our earth evidently extends to the moon, which is computed to be about two hundred and fifty thousand miles, by its passing over the moon's body, and producing what we call an eclipse.

towards it, so in its relative situation to the sun, and our earth, it must appear, with its phases, similar to the moon.

Thirdly.—Why comets appear with a tail, and that tail always in an opposite direction to the sun :—Because the tail is only a small part of that luminous appearance which we should actually behold surrounding the whole, were not the greater part hid from our view by the overpowering rays of the sun shining upon it, and leaving to our view that part only which the sun leaves in darkness, and which, of course, must be always in an opposite direction to it.

Fourthly.—Why the tail of comets vary in their length and luminous appearance, and sometimes appear without a tail :—Because it is regulated by the state and degree of the surrounding conflagration, distance from the sun, and clearness of our own atmosphere ; and when situated in a line with our earth and the sun, or when its whole illuminated face is presented to our view, its tail, of course, must be rendered invisible to us, and whose body will always then appear globular.

Having thus stated my opinion on the subject of comets, I should be happy to see my ideas supported by an abler pen ; or, if rejected, to see that rejection accompanied by a theory better calculated to harmonize the general appearance of those heavenly orbs.

I am, &c. J. F.

Cranbrook.

ARCHIMEDES.

The memory of Archimedes appears to be universally venerated at Syracuse. From the familiar but respectful mention made of him, he seems to have belonged to an age as recent as that of Franklin ; and one is almost tempted in meeting with an aged Syracusan to ask if he did not remember seeing the philosopher in his youth. At any rate, the impression left by his name here is more vivid, apparently, than that associated by us with Franklin. The walls of the conversazioni room are covered with pictures of his mechanical exploits. One is very spirited, and represents his lifting, with his famous levers and grapples, the galleys of Marcellus from the water, and then sinking, or dashing them against the rocks.

The road winding up a gentle slope at length intersected another, called the Street of Sepulchres, from its leading in a narrow defile between hills faced on either side with ancient tombs. Near the entrance of this passage, and about one hundred yards from the spot traditionally remembered as the place of the Agragian Gate, stands the tomb of Archimedes. The locality agrees very well with the description given of it by Cicero. The ancients were in the habit of burying their dead without the walls of their cities ; and the sepulchres of Syracuse came up to its very gates on this quarter. "There is," says the Roman orator, "close by the Agragian port, a vast number of tombs. Examining them with care, I perceived a monument a little elevated above a thicket, whereon was inscribed the figure of a cylinder and sphere. Immediately I said to the Syracusan nobles who attended me, That this must be the tomb of which I was in search."

We alighted to take a nearer view of it. In front, is a narrow strip of cultivated, unfenced ground ; and just at the entrance a few brambles and rank weeds were growing. The tomb is excavated from a native bed of rock, the face of which, naturally projecting, is shaped about the opening into a rude Doric front, with pilasters and a pediment. No traces of the inscription are visible, nor is this to be wondered at, for even in the time of Cicero, the characters were partially worn away. The entrance of the tomb is sufficiently high to allow a person of full stature to walk in without stooping. The interior is of moderate dimensions. It is truly "the dark and narrow house." In a recess on the right, large enough to receive a modern lead coffin, the remains of the philosopher are supposed to have been laid ; but the sarcophagus, if any there were, has long since disappeared. On the opposite side are full-length receptacles for bodies ; and fronting the entrance there are smaller depositories, cut like the others from the solid rock, and adapted for urns, or the coffins of children. The tomb appears to have been the family sepulchre of Archimedes ; but the ashes of the human forms, which once filled its niches, have for ages been dispersed to the four winds.—*Bigelow's Travels in Malta and Sicily.*

COMMERCIAL SCIENCE.

What is the Value of the Colonial Lands?

Sir,—You state (No. 455.) from the American Almanac, for this year, that

the people of the United States having discharged, by the sale of their national lands, the debts which were contracted for the purchase of the western states from the Indians—of Lousiana from the French—and the Floridas from the Spaniards—have remaining, a capital in land which amounts, at least, to the almost incredible sum of 1303,078,963 dollars! To this point, I have not been misinformed.

I request you will allow me space, in your next number, to supply the want of information of the American almanac for this year. No individual has ever received, from the United States, either half-pay or pension. Public services, both civil and military, are rewarded by grants of land. In 1815, the war establishments of the United States were disbanded, to add to the national wealth, by cultivating the national lands. In the following years, 1816-17-18, the English war establishments were disbanded to be—"*a dead weight* upon the national industry." Sixteen years having expired, the American policy is to be adopted. France is endeavouring to do the same at Algiers.

I do not know to what amount the Land Department of the United States, has accounted to Congress, for lands sold. The estimate of the Land Department, for one year, 1831, is, for lands sold, 700,000 pounds. An account is annually laid before Congress.

You have raised a most important question. The United States, whose only want is a supply of labour, require, from the Europeans, at least 1303,078,963 dollars, for the lands belonging to their public treasury. The principal want of the United Kingdom, and British India, is, *per contra*, a demand for labour. If Europe be crowded, then, certainly Asia requires the Asiatic and African colonies for breathing room. There are steam vessels throughout Asia. Then, what shall be the minimum price of the English colonial lands in Asia, Africa, and America? What is the capital in those lands?

The English Colonial Department, having no value for the English lands, on the northern frontier of the United States, compelled the United States to reduce the minimum price of land *to one* dollar *twenty-five cents per acre, which* is seventy-five pence English decimal currency of the United States.

Yours, &c. T.

April 28.

Errata.—No. 455, p. 53, for "roads" read "roods"—298,233,600.

A PARADOXICAL THEOREM.

Sir,—A friend of mine who is fond of paradoxes, has put into my hand, what he is pleased to call a Theorem, and its demonstration. I shall be obliged to any of your mathematical readers who will detect for me the weak link in my friend's chain of reasoning.

Theorem.

Straight lines cannot be drawn from each and every point in the circumference of a circle perpendicular to its diameter.

If the diameter of a circle consist of a thousand points, the semi-circumference will contain something more than fifteen hundred. Now, if from the fifteen hundred points of the semi-circumference straight lines are drawn to the ten hundred points of the diameter, it is evident that some of the points of the diameter must have two straight lines meeting in them; and that if one of the lines is perpendicular to the diameter, the other cannot be so; because at the same point there cannot be more than one perpendicular to the same straight line; therefore straight lines cannot, &c. Q. E. D.

J. H.

Jersey, March 3, 1832.

ON STREET PAVING.

Sir,—"One who works Horses in London Streets," (p. 63), will find, on referring to vol. xv. p. 319, that the evils attending the new mode of paving, have already been the subject of comment, and a remedy suggested.

Upon the plan submitted by the above writer, I must crave permission to make a few remarks, as a slight difference of opinion exists between us upon the merits of the two methods.

Your correspondent recommends the adoption of small strips of granite of equal depth with those now used, but not exceeding from three to four inches square; to this I conceive there are several strong objections.

The great improvement introduced by the new system, consisted in a more careful formation of the bed of the roadway, and in the employment of larger blocks of stone; by which means, a firm, level, and durable pavement is obtained, but slippery withal.* The object should, therefore, now be, to retain all the real advantages that are gained, and endeavour to provide a remedy against the only defect, the smoothness. This is done pretty efficiently by cross-cutting, as adopted on Holborn Hill, and would also be effected by the bevelled edges, as suggested in my paper before referred to; and with this difference, that my plan would afford a remedy for the side slipping, which the cross-cutting does not. Perhaps the two methods might be advantageously combined.

To exemplify the different circumstances, or, rather, the different effects under similar circumstances, which attend the employment of large or small stones in paving, we will consider the effect produced on each by a cart or waggon-wheel exerting a force or pressure of one ton weight.

We will first take one of the new stones, 14 inches long by 4 wide = 56 square inches, which gives the pressure of the stone on the bed of the roadway at 40lbs. per square inch; while with one of the "granite strips," say 4 inches long by 3 inches wide = 12 square inches, (the weight being as before), the force pressing the stone, and tending to drive it into the under stratum, would amount to 186⅔lbs. upon the inch!

We may, therefore, reasonably conclude, that a weight which would produce no ill effects upon the large stones, would inevitably destroy the evenness and regularity of a pavement composed of small ones, and soon bring it to the same wretched condition that the old pavements always exhibited after little more than a fortnight's wear.

In considering the fault of the new pavings, it is but fair that we should also take into account the great advantages obtained; in the relief afforded to the horses by the reduced draught, and also the reduction in the wear and tear of machinery; and if the question be fully and fairly stated, I am satisfied every impartial observer will admit a decided balance in favour of the new system, although it is yet some distance from that state of perfection, which, in my opinion, it is certain eventually to attain,

Yours, &c. WM. BADDELEY.

May 2, 1832.

* Since I last addressed you upon this topic, I have witnessed many accidents on the new pavements. Upon two occasions, I saw the leaders of a mail-coach slip down and the wheelers fall over them, all four horses being sadly entangled, and not separated until the animals, as well as the harness, *had been much injured; these* accidents both occurred *in the Poultry.*

MR. AUDUBON.

We have had a personal interview with the writer of the letter signed "Quivis," inserted in No. 453, and learn from him that application has been made to Dr. Jones, of the Franklin Journal, to retract the charge of want of veracity brought by him against Mr. Audubon, in relation to the natural history of the rattlesnake—and accompanied by such proofs as leave no doubt, in the minds of Mr. Audubon's friends, of his complete exculpation. He has also explained to us, satisfactorily, how the delay, in demanding that retractation, has arisen from Mr. A's peculiarly unsettled habits of life. We have no hesitation, under these circumstances, in holding over for reconsideration, the opinion we had formed and expressed on the subject; and in requesting that our readers will, with us, abide the result of this application to Dr. Jones. Incredible as some of the rattlesnake stories, told by Mr. Audubon, appear, it must be confessed, that in natural history, it is not always the least improbable which is the most true.—Ed. M.M.

CASE IN PLANE TRIGONOMETRY.

Sir,—In taking the altitude of a tree on a declivity, during the past year, I perceived there was a deficiency in the rules of plane trigonometry, for obtaining the altitude or depression of remote objects on acclivities or declivities.

I therefore take the liberty to submit a problem of this nature to such of your readers as are familiar with the subject.

The first angle, near the object, was 29° 30′, the instrument, level with the bottom of the object, going 53¾ feet farther from the object in a direct line on a declivity; the second angle was 3° 45′

to the bottom of the object, and 18° 21′ to the summit. Required the height by two statings?—I am, &c.

CHARLES HYDE, Surveyor.

Horsley, Gloucestershire, Jan. 19, 1832.

NEW GUN INTRODUCED INTO ENGLAND BY M. JACQUES AUGUSTE DEMONDION.

(Communicated by the Inventor and Patentee.)

The gun is loaded and primed at one operation, and is cocked by lifting up the breech to introduce the cartridge.

The cartridge is of a peculiar kind; containing within itself a tube filled with detonating powder, which, exploding in the very middle of the cartridge, produces a better discharge. It requires a third less powder than common cartridges, and the bore of the gun is greater at the breech than at the muzzle, which makes it carry farther and more correctly.

From the peculiarities of the cartridges and barrel, the cartridges taken from the enemy, can be immediately used with the new gun, but the new cartridges will not do for the pieces of the enemy.

The bayonet is more easily managed in exercising; is more difficult to be pulled off by an enemy; is longer, and the shoulder shorter than usual; therefore it is stronger; and being underneath the gun instead of at the side, is more dangerous, and does not interfere with the aim; the charge is completely covered up and protected from wet.

The gun is so easily managed, that with a few hour's practice a soldier will fire 10 to 19 shots a minute; and can load and fire upright or lying down—marching or standing—one almost as well as the other. From not having to use his arm to load, he is less liable to be wounded by the enemy's shot; and for the same reason, the gun is particularly advantageous on board of ship. Moreover it can be loaded easily in the dark.

And although more shots are fired in a minute, the barrel does not heat so much as those of common guns, because at every shot there is a rush of air through it.

It is very strong, cannot be inadvertently double-loaded, and is free from many of the disadvantages of flint or percussion lock guns.

It is simple, and can be made by common workmen, and all its parts are of regular shape, so that they can be made by machinery, which will reduce its expense below that of ordinary guns.

It is easily cleaned, having neither cocks nor any complicated system of springs; and the ring that holds the bayonet on, has a screw-driver on it to unscrew the parts.

INQUIRIES.

Sir,—There is a great diversity of opinion in this and the adjoining county, on weighting the steam clacks of the different engines, particularly those of Watts and Bolton's; some applying 1, 2, 3, and even to 6, upon the square inch of the said clacks.

I should feel obliged to some of your scientific readers, or correspondents, if they would, through the medium of your Magazine, favour us with "the proper and absolute weight" necessary for that purpose; it being a subject of great importance to the practical engineer.

I am, Sir,

Yours, truly,

Y. Z.

Old Park, Shropshire,
Feb. 24, 1832.

P. S.—Several instances have occurred of the explosion and blowing-up of the boilers of Watt and Bolton's engines, though of low pressure. Is not this caused by the conversion of the small quantity of water (left in the boiler and heated considerably) into hydrogen gas?

Y. Z.

Mr. Editor,—Will some of your scientific and practical correspondents connected with steam navigation, have the kindness to furnish a rule or rules in decimals, for calculating the resistance in different vessels for canals, rivers, and seaboats; also, for determining the requisite power of engine to put into each kind of boat to overcome such resistance, the best speed for paddles, and the average weight of low-pressure engines, as now in use for horse-power, including water in boiler? By favouring me with this insertion, which may, perhaps, be answered by some correspondent who wishes to forward the improvements of steam navigation, you will greatly oblige your Constant Reader,

EXPERIMENT.

Sir,—Will you grant me the favour of inquiring through the medium of your valuable Magazine, "the method of finding the exact value of a leasehold estate, respecting which, three professional gentle-

men considerably differ in opinion. I have perused several treatises on the subject of compound interest, but have not met with an analogous case. The kindness of some of your intelligent correspondents will probably prevent a vexatious law-suit; and particularly oblige,

Yours, respectfully,
J. REPRY.

March 19, 1832.

CASE.—The value of an estate let at 900*l.* per annum, held by lease for 21 years, from Lady Day 1827, subject to the payment of ground rent, land tax, and other goings, amounting to 50*l.* per annum; and also, to a gift of 100*l.* every seventh year (towards the support of an hospital); the rate of interest agreed upon is 8 per cent. The lease is granted by a college, and is renewable every seven years, upon payment of a fine; the last fine paid was 1000*l.*

J. R.

Sir,—Will you permit me to ask your numerous mathematical readers, if they can give any information on the rate of sickness that occurs among the working classes in London, regard being had to ages. My object is to collect materials on which to form data for the sickness tables for friendly societies. I am aware of those calculated by Dr. Price; but, I understand that they have been proved to be fallacious; indeed they stand condemned by Act of Parliament—by which it is declared that no sufficient data was known three years ago.

I remain, Sir, your's &c.
CRITO.

April 12, 1832.

Mr. Editor,—Will any of your numerous readers oblige me by a solution of the following question:—Supposing a well to be sunk to the centre of the earth, at what point would the air be most dense? And to what height would the barometer rise at that point? Also, at what height would it stand at the centre of the earth?

BENGEIR.

[A second question from our East Indian friend, he will find disposed of by Kinclaven, at page 48 of our last volume. —ED.]

Sir,—Will any of your correspondents be kind enough to communicate the process of repreparing any part of a stone where an inked line has been scraped out, for the reception of other lines or chalk?

F. R.

April 20, 1832.

Pedo-motion.—"Sir, You say (p. 48) that 'man is a locomotive machine of nature's own making, and not to be improved by the addition of any cranks or wheels of mortal invention." Now, Sir, I once skated a mile in four minutes, which is a rate of velocity far exceeding any thing ever accomplished by the naked foot; and on untying my velocipedes, I found they were made not by "Dame Nature," but by Giles Handsaw, of Ironmonger-lane, London. What saith thy philosophy to this, good Mr. Editor? Yours, doubtingly, A FENMAN."

[When we said that the human machine admitted of no improvement, the observation had reference to that description of locomotion only which it was appointed to exercise ordinarily and habitually—namely, walking; and with a view to which it was, of course, chiefly constructed. The use of machinery—indeed, its only use in connection with our bodily strength—is that it enables us to exert that strength successfully under circumstances to which it is not naturally adapted. A man, for example, cannot draw up a bucket of water from a well 100 feet deep, by means of a rope merely; but give him the aid of a pulley, and the thing is done easily. So, in like manner, he cannot move as fast on ice as he can on the green sward; but give him skates, and he moves twice as fast;—not, however, then walking, but sliding, which is something as different as descending the Slide of Alpnach astride a pine-log.—Ed. M. M.]

Russia Leather.—"My dear Sir, On popping into an omnium-gatherum-sort-of-store-house in the City, the other day, I observed a quantity of leather from the Land-o'-Kilts, spread out to be aired, while close bye there was a lot of Russia leather which remained in bulk as it had come to hand, and did not, as I was told, need any airing at all. I inquired the cause of this curious difference, but all the answer I could get, was, that the one contracted mouldiness and the other did not—the why and wherefore nobody could tell me. Conceiving that the subject is one well worthy of being put into a train of investigation, I trouble you with these few lines (hoping I don't intrude) and am, my dear Sir, your old (though unavowed) friend, PAUL PRY."

[Russia leather owes its freedom from mouldiness to its peculiar perfume, and that perfume is derived from the birch tar with which it is smeared; but, beyond this, philosophers know as little as our friend Paul himself. The antagonist properties possessed by different perfumes, present an interesting field of inquiry; but one which has been hitherto only very partially explored.—Ed. M. M.]

INTERIM NOTICES.

"A Puzzled Gardner," should state the length and greatest breadth of the space he intends planting.

Communications received from An Amateur—J. J. C.—Resurgam—Saxula—G. P.

ERRATA.—P. 45, col. 1, l. 2 from the bottom, for "below," read "above."

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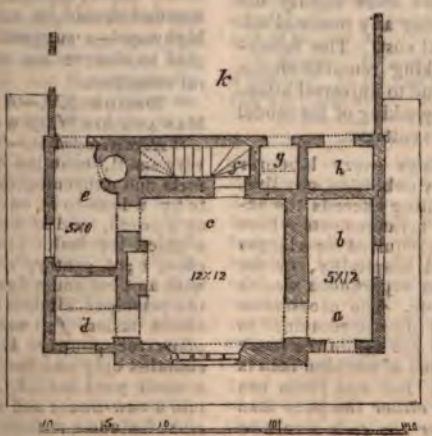
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 457.] SATURDAY MAY 12, 1832. [Price 3d.

DESIGN FOR MILE-STONE COTTAGES.



MILE-STONE COTTAGES AND COTTAGE ARCHITECTURE GENERALLY.

We have now before us the First Part of the "Encyclopædia of Cottage, Farm, and Villa Architecture," which we lately announced as being in the course of preparation by Mr. Loudon; and judging from this specimen, we should say that it will yield to none of all his works (and that is saying a great deal) in point of ability and usefulness. Excellent as are his Encyclopædias of Agriculture, of Gardening, and of Plants, it cannot be be said of any of them so decidedly as of this, *that it was wanted*. There is nothing so necessary to personal comfort—few things more conducive to elevation of character—than a pleasant home; and yet there is nothing about which the British people—in the country parts especially—have more to learn, than the proprieties in which such pleasantness consists. The popular *beau-ideal* of a pleasant cottage is made up of two principal particulars, white-washing and honeysuckle; elegance of elevation and interior commodiousness seem to be looked upon as matters very much out of the question. Now, Mr. L. lays it down as an axiom, and the truth of this axiom his book abundantly establishes, that "all that is essentially requisite for health, comfort, and convenience, to even the most luxurious of mankind," may be comprehended in a well-constructed labourer's cottage, and the canons of good taste be at the same time rigidly observed, without causing any material addition to the original cost. The following sensible and striking remarks on the subject we recommend to universal attention; the author is speaking of his model designs for labourer's cottages.

"In such dwellings every labourer ought to live, and any nobleman may live. All that in any dwelling exceeds the accommodation and arrangements here given, must either be required for a larger family and extended hospitality, or for the display of either superfluous wealth or highly refined taste. The necessaries and even comforts of life are contained in a small compass, and are within the reach of a far greater portion of mankind than is generally imagined. But one room can be used at a time by either the poor man *who has no other*, or the rich man who *has several; and that room* can only be *rendered comfortable by* being warm, dry, light, well ventilated, and convenient; qualities which depend not so much upon the materials used in its construction as on the manner of applying them. All that is wanted is knowledge—first, of what is necessary and desirable; secondly, of the means of obtaining it at a small expense."—P. 8.

To communicate that knowledge is the particular object of the portion of Mr. Loudon's work now before us. His general mode of treating the subject is this:—He gives first a design for a cottage, that is, the ground-plan and elevation, as furnished to him by one or other of the following architects, whose names appear as *collaborateurs* on the title-page of the work—Messrs. J. Robertson, J. Perry, R. Varden, S. Thomson, J. Rowe, &c.—we have then under the heads of "Situation," "Construction," and "Accommodation," a variety of explanatory details and critical remarks; next, a "General Estimate" of the cost; and, finally, a section devoted to what Mr. L. calls, not very happily, the "Expression" of the cottage, that is, its expression of the purpose for which it is erected, a quality which, according to Mr. L., should be obvious from the architecture of every building whatever, "altogether independently of any particular style." We select, by way of specimen, Design XV., (see preceding page) not because it is the best of those before us, but because it is recommended by Mr. L. as a fit model for those mile-stone cottages which our ingenious correspondent, T, lately recommended should be erected along all our highways—a suggestion which we are glad to observe has attracted very general attention.

"DESIGN XV.—A DWELLING FOR A MAN AND HIS WIFE WITHOUT CHILDREN.

"*Accommodation.*—This cottage, though very small, contains a good many comforts and conveniences. The entrance, *a*, is by a lean-to at one end, which serves as a porch, and at *b* may also be used as a place for fuel. There is a good kitchen, *c*; a pantry, *d*; back-kitchen, *e*; with an oven and a flue to heat the floor of the principal kitchen: a staircase with a closet under, *f*; water-closet, *g*; and place for poultry, *h*. The upper story contains only one bed-room, *i*. There is a small yard behind, *k*, which may contain a cow-house and a pig-sty, and which must include a manure-well and dung-pit.

"*Construction.*—The walls are here represented of rough stone plastered, and

Fig. 100.

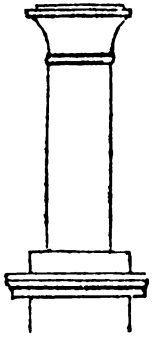
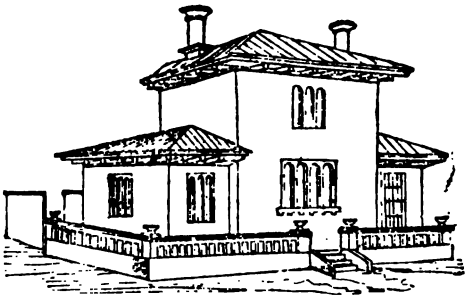
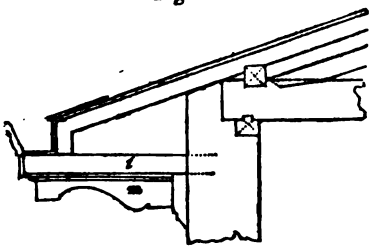


Fig. 102.



the roof as covered with Grecian or Italian tiles. The terrace is of masonry, and the chimney-tops (fig. 100) on a scale of $\frac{1}{4}$ of an inch to a foot, are of brick and cement. The projection of the roof is considerable, and it is furnished with a gutter, supported by short pieces let into the wall, fig. 101, and by centre-levers,

Fig. 101.



m. The blocks supporting the sill of the kitchen-window are of stone, and so is the sill. The mullions which divide the window are of wood, and the casements which fit into them are hinged, so as to open inwards. The windows of the pantry and back-kitchen are sash-windows. The principal objection which we have to the construction of this cottage is the placing the fire-places in the outside-walls. For cold climates this is always with us a very great objection; though as this building is in the Italian style, it may be supposed to be adapted for the south of Europe, the most southern parts of North America, or for Australia. With a view to these countries, our objection falls to the ground; and, in truth, we have raised it chiefly for the purpose of showing that some objections to buildings of this description, and, indeed, to all buildings are relative. *Of positive or absolute objections which have no relation to either country, climate, or situation*, we see none in this design. It is on a dry foundation, of sufficient strength in construction, and of sufficient durability in its materials. It is securely roofed; the rooms are sufficiently lofty, well lighted, and may be, if the occupant thinks fit, well ventilated.

"*Situation.*—This building having no windows behind, is calculated for being placed upon the sides of a hill, and viewed from below. If surrounded by a good garden, and with no trees within a hundred yards of it higher than fruit-trees, it can hardly fail to have a good effect. In general, trees which stand close to any building, more especially to one of small size, should either be decidedly larger or decidedly smaller than the building itself. The chief reason for this is, that objects of the same size or apparently so, do not co-operate well in forming a whole; which always must consist of one principal or prominent part, and of two or more subordinate ones.

"*General Estimate.*—Cubic contents, 8 206 feet, at 6*d*., 205*l*. 3*s*.; at 4*d*., 136*l*. 15*s*. 4*d*.; and at 3*d*. 102*l*. 11*s*. 6*d*.

"*Expression.*—The style attempted is evidently Italian; but why a deviation was made in the wings from the Italian Gothic window to the common English sash-window, is not obvious. The fault is not a great one, because so far from interfering with utility, a superior article is introduced instead of an inferior one. But in respect to appearance, these windows certainly diminish the force of the style. Reduced to their proper form, and a parapet added to the terrace, fig. 102, this dwelling would produce a very good effect; and might serve for one of those which a recent writer in the Mechanics' Magazine recommends to be substituted for mile-stones along the public roads of Great Britain. To the cottages so placed he proposes to attach large gar-

dens, and those with the cottage are to serve as models for neatness and order in their appearance and management to the agricultural labourers in the vicinity. The occupier of the cottage is to sit rent-free, on condition of keeping the sides and fences of one mile of road neat and orderly, and as free from weeds and all obstructions as the approach-road on a gentleman's park; a labour which might occupy him fifty or sixty days in the year. Mech. Mag. vol. xvi. p. 410."

After disposing of the cottages proper for "labourers, mechanics, country tradesmen, and small farmers," and "lodges for gardeners, bailiffs, land-stewards, and other superintendants on landed estates," Mr. L. proposes to give "designs for farm-houses and farmeries, country inns with farm-buildings attached, fermes ornées, (what will F. H say to this importation?) and villa-farms;" also "designs for cottage-villas and villas of the highest class, with their accompanying offices and other buildings." All these things, however, are to form but one division of the work, which is to be followed by three others, comprehending "The Geographical History of Cottage Farm and Villa Architecture"—"The Literary History of Cottage Farm and Villa Architecture"—and "The Grammar and Principles of Civil Architecture generally." A "Glossarial Index" is also to be given at the conclusion, in which "every technical term and expression made use of in the work" will be explained and illustrated. We are afraid the last three divisions will add more to the bulk than to the value of the work; and perhaps it may be yet worth while to consider, whether all that is of importance to be known, respecting the history and principles of cottage and villa architecture, might not be given at the same time with the "Designs;" in which, of course, the principal utility of this Encyclopædia to practical men must always consist.

MATHEMATICAL DEMONSTRATION OF THE CORRECTNESS OF LIEUT. DRUMMOND'S PRINCIPLE OF REPRESENTATION.

Sir,—About two months ago a certain nobleman sent for me, and requested an algebraical solution of the following *question*:—

Suppose the population of England, *Scotland, and Ireland,* to be A, B, and *C, and the amount of taxes* paid by each country to be a, b, c; how many Members ought each country to return to Parliament (D being the whole number) taking into account the joint ratio of population and taxes, and give the result in numbers; supposing A, B, C, to be 13,89400, 2,365000, 7,734000, and a, b, c = £43,258990, 5,113353, 4,392101, and D = 658?

I mentioned to his Lordship that Lieutenant Drummond had explained how the question should be solved; adding, that, although I had never seen an investigation of his method, still I was convinced it was impossible for that young but able mathematician to err in principles. His Lordship candidly admitted, that he did not fully understand the Lieutenant's method; and that he himself had solved the question, but the results were not the same as those obtained by the Lieutenant's method. But "give me (said his Lordshop) a plain solution of it, according to the laws of common sense; and if it shall agree with that deduced from the Lieutenant's method then I will own myself in error." Next day I presented his Lordship with the following solution:—

Assume that $A+B+C=S$ and $a+b+c=s$; then $S : A :: D : \frac{AD}{S}$ = number of Members, England ought to return, if population only forms the basis of importance; and $s : a :: D : \frac{aD}{s}$ = number when taxes only form the degree of importance $\therefore \frac{1}{2}\left(\frac{AD}{S}+\frac{aD}{s}\right) = \frac{D}{2}\left(\frac{A}{S}+\frac{a}{s}\right)$ = number England should return, according to the joint ratio of population and taxes. In the same way the respective numbers for Scotland and Ireland will be $\frac{D}{2}\left(\frac{B}{S}+\frac{b}{s}\right)$ and $\frac{D}{2}\left(\frac{C}{S}+\frac{c}{s}\right)$ and restoring the values of A, B, C, a, b, c, and D, the number for England will be 460¼, Scotland 64½, and Ireland 133¼.

His Lordship had some misgivings about the accuracy of the principles of the above solution, arising apparently from the employment of an arithmetical instead of a geometrical mean. Two days after, I therefore, sent his Lordship the following additional solution, which

will be found to agree exactly with the above:—

Second Investigation.

Using the same notation as before, let i be the value of importance of an Englishman, a Scotchman, or Irishman $\therefore \frac{a}{A} + i$ will be the value of importance of an Englishman in point of population and taxes. Hence the whole importance of England in these two respects will be $A\left(\frac{a}{A} + i\right) = a + Ai$; and for the same reason $b + Bi$ and $c + Ci$ will be the respective importance of Scotland and Ireland. Hence $a + b + c + i \cdot (A + B + C)$ or $s + Si$ will be the united importance of Great Britain and Ireland. Consequently, $s + Si : a + Ai :: D : D\left(\frac{a + Ai}{s + Si}\right)$ = number England should return, and $D\left(\frac{b + Bi}{s + Si}\right)$ and $D\left(\frac{c + Ci}{s + Si}\right)$ will be the numbers for Scotland and Ireland. It now only remains to assign a proper value for the arbitrary quantity i. Now, let it be remembered that, in point of importance, we have supposed that an Englishman, a Scotchman, and an Irishman, are each of the same value $\therefore$ the only value that we can rationally assign for i is the quotient produced by dividing the whole amount of the taxes by the united population, that is, $i = \frac{s}{S}$. Hence by substitution $D\left(\frac{a + Ai}{s + Si}\right) = D\left(\frac{a + A\frac{s}{S}}{2s}\right)$

$= \frac{D}{2}\left(\frac{A}{S} + \frac{a}{s}\right)$ the same as in the first solution, &c.

His Lordship, after trying the effect of other values for i, at last fairly acknowledged that no other rational value could be assigned for i but $\frac{s}{S}$; and, concluded his Lordship, it is but fair to allow, that "A man's a man for a' that."

I am, Sir, yours with respect,

GEORGE SCOTT,

Professor of Mathematics.

9, Great Quebec Street, Montague Square,
May 1, 1832.

LETTER TO THE RIGHT HON. THE EARL DUDLEY AND WARD, ON THE EXPLOSIONS IN COAL-MINES.

My Lord,—Your Lordship being deeply interested in the affair, no apology is necessary for addressing to you a letter, which has for its object to show that the desolating effects of the carburetted hydrogen gas of coal-mines, and the paralysing consequences in regard to the trade, prosperity, and comforts of society at large in Britain, demand an early and most minute investigation; the many very recent explosions having sacrificed some hundreds of human beings to the continuance of the *diluting method* of ventilation in different parts of the kingdom.

My several private letters to your Lordship remaining unanswered, (possibly from having been sent through your agent, who is interested in veiling the merits of my system), there appears to me no other way of obtaining impartial justice than a public appeal to your Lordship, in reference to a promise long unfulfilled. And it will be an act of patriotism for your Lordship to set right the public mind on the following particulars also. Were there ever any explosions in the collieries of the south of Staffordshire? For how long a period did they continue? Have they now ceased altogether? What operations or methods have accomplished this great advantage? That your Lordship may the more easily furnish the answers to these questions, I beg to supply a few observations.

In the coal-mines of England, at the present time, an astounding number, perhaps some thousand persons, are annually burned by explosions, of whom some hundreds perish, either in the mines, or subsequently of the injury sustained. And the explosions, as the cause of death, must be specially regarded. The statement in the *Whitehaven Herald* relative to the late explosion at Whitehaven, in which twenty-two brave colliers fell beneath the destructive flame, shows a desire in the Coroner to suppress minute inquiry, and to assign the whole affair to *accident*. He is not acquainted with the old custom at Dudley, else he might have followed it; for there, not to waste persons' time on inquests, the same *quietus* of accidental death used to be given to every sufferer from every one of the

many thousand explosions which annually occurred, or were made artificially by the pole and fire line. Your Lordship is well aware, that in the mines of the south of Staffordshire, comprehending an area of 20 miles, the explosions were, till the year 1808, almost a thousand to one of those in all other parts of England together; some of which shook the ground like an earthquake, and were heard and felt in the town of Birmingham; and the deaths from the explosions were in the ratio of a hundred to one.

In 1800, the coal-mines on the Tyne and Wear were so free from hydrogen, in comparison with those of the south of Staffordshire, (Dudley, and its vicinity, where the quantity exploded in a single mine each time exceeded tenfold that of all the first-mentioned combined), that the two most celebrated coal-viewers of that day, Messrs. Barnes and Johnson, of the Tyne, could not devise, with all their ingenuity, means to lessen the artificial explosions, even *one* in a day. The method of quarrying the virgin coal on the Tyne is the wasteful and barbarous practice of cutting the bed in narrow passages, called *boards*, reducing much of the coal to slack; yet, by this method, in the non-explosive pits, and those above the 90-fathom dyke, and also those below it, the expense was about 8*s*. per Newcastle chaldron of 53 cwt. The accumulation of carburetted hydrogen, at that day, was little; and the usual current of air through the works by two pits much abated the deleterious effect.

When (in 1806) I offered to the Coal Trade of the Tyne my services to introduce a method of ventilation, which completely precludes explosions—the direct opposite of that which attempts to secure safety to the collier who quarries the coal for sale, by supplying 14 or more volumes of air to *dilute* that of the hydrogen generated—Mr. John Buddle regarded such a change as unnecessary, there not being *one* explosion yearly, nor one death in ten years. He added, that he designed superseding all liability to explosions by a method he was about to introduce. In this he appears to have failed absolutely; the hydrogen has increased in the mines, the expense of working has gradually advanced, the price being now, not 7*s*. 10½*d*., but from *17s. to 23s.*! the difficulties appearing to *augment with the increase of* demand Mr. B. imagined that he should readily get the pillars left in the mine without danger; but, my Lord, only for a moment reflect on his statement to the Lords' Committee on the Coal Trade, that in one of the works of which he had the charge, to render the air therein—not non-explosive, for that idea seems abandoned by Mr. B.—but merely respirable by the colliers, he has to force into the mine 18,000 feet of air per minute! Your Lordship will instantly remark, that only erroneous reasonings on the nature of aerial fluids can have led to conclusions so philosophically absurd. However powerful may be his steam-engine, or enlarged his blowers, the dreaded mischief may ensue the moment the engine stops working, or abates in the number of its strokes per minute, or the hydrogen gets a lodgment in any part of the mine at rest. Thus the public are required to pay a tax of from 9*s*. to 15*s*. per chaldron of coals, on account of *want of ventilation*. The numerous unsuccessful attempts to adequately neutralise the hydrogen so as to prevent explosions, have removed all doubt of the inefficiency of the *diluting* system; and the protection of the collier is now dependant on that equally defective and weak remedy, the *lamp*—a thin wire tissue, liable to be oxidized and destroyed. An inspection of Mr. B.'s drawing will show the great waste of coal to the mine-owners, and consequent loss for ever to the nation, in the *sunken*, *sinking*, and *overwhelmed* pillars, left when quarrying the virgin coal; which waste of material, and, consequently, of capital, with the sacrifice of life from additional accumulations of hydrogen, (as of 100 men not long ago in the Wallsend Colliery), will so enhance the expense of quarrying the pillars, as ere long to render such mines of no value. And, my Lord, only contemplate the general disadvantage to each family, and the moral injury sustained by children, from the loss of fathers—the amount paid by benefit societies on account of burnings and funerals of colliers—and the additional expense incurred by parishes to support widows and their families! The late explosion at Wigan has left eleven widows and forty children, whose support weekly will be from two to three pounds. Now, were each hapless miner only valued at the same price, though a

free-born Englishman, as is paid for the son of Africa, when purchased as a slave, would not the account present an appalling item; and the consequent expenses greatly increase the balance against the system?

Your Lordship probably will recollect the offer of my services, in 1808, to ventilate certain mines, and at all risks to supersede explosions therein, being (for your father, the late Lord Dudley and Ward), accepted by one whose heart does honour to humanity, the Hon. Washington Shirley. The necessity for such ventilation will appear from this fact, that if we draw a line from near Stourbridge, through Netherton, Dudley, West Bromwich, onwards nigh to Walsall, the western portion of the Staffordshire coal-field is for about 80 miles in area, free from accumulations of hydrogen and explosions; so that the coals are quarried, without regard to the method, for less expense than was the virgin coal on the Tyne. But the eastern portion has the coal-beds thrown down 100 yards by a series of faults along the line; and while an acre of land on the western side has been sold for 1500*l.* even 50*l.* has been regarded as exorbitant for an acre on this side. The few coal-mines opened along this line at that time (1808) were rendered so imminently dangerous by the accumulation of hydrogen, that there were requisite, daily, artificial explosions, of probably 50,000 feet of gas; any of which would have instantaneously destroyed an immense number of persons had they been exposed to its violence. The firemen, a most courageous class, to combat Nature's volcanic powers within her own domain, inclosed themselves in stables excavated out of the solid rock, closed by massive doors, and fortified in every way which care and prudence could suggest; yet not unfrequently all would prove resistless, and they would perish by the explosion, though recorded in the Coroners' registers as having died *accidentally*. The Netherton Colliery, from its opening, (in 1792 or 1793), had been gradually augmenting in danger, from the artificial explosions increasing from *one* to *fifteen* daily; and so many persons suffered, that they were named the *Slaughter Works*; the parishes objected to the expense of the inquests on the men; the farmers complained of the loss of time required by *them*; *and none* but the most desperate men could be procured to work the mine, by premiums of 25*l.* to 50*l.* and wages double those paid in the non-explosive pits west of Netherton!

Having made the proper arrangements for the very important and not a little dangerous undertaking, which I have ever considered as that alone which is to rid British and all other colliers of their most formidable enemy, hydrogen—not by diluting the gas, and then removing it, but by ventilation, rendering impossible the accumulation of gas for explosion, by drawing off the whole quantity generated through a gas-head, connected with a passage to the surface, yet wholly distinct and shut out from the parts where the men are employed; on December 3, 1808, having with me two men and two boys, I took charge of Wilcox and (the agent) Arton's Mine, selected because one of the most terribly explosive; and on the 27th of the same month I pronounced the works safe, or non-explosive. The late Lord Dudley appointed a committee to inspect the mine; and, as previously, the accumulation of hydrogen had been about 20,000 feet each 8 hours, the inspection was delayed until Jan. 1, 1809, on which day upwards of 40 spectators accompanied me into the works, to witness this victory over so destructive an enemy!—A victory unparalleled by any of those resulting from the cogitations of despots, how they may most readily exterminate their neighbours. My campaign was bloodless, though my enemy, whenever he approached, unnerved the strongest arm, and made the stoutest heart to tremble. What soldier will enter a well-stored magazine, with a flaming candle in his hand? Yet the colliery firemen daily encountered a more terrific danger, an accumulation not of a few barrels of gunpowder, but of native thunder, hydrogen, and oxygen; and this to supply coals for the manufactures of Britain. The triumph was complete! The most careful examination of every part by Francis Downing, did not produce an y explosion, although opportunity of four days had been allowed, and by the diluting system there would have been 200,000 feet of gas present. The Rev. Humble Ward was one of those present on the occasion. Every one was delighted at the result, except Mr. Downing, whose motives for the disappoint-

ment he evinced, I leave your Lordship to conjecture. This person next asserted, that a certain mine, (No. 18), which by my method was always clear of hydrogen, was not *naturally* explosive. On this, the Hon. Mr. Shirley ordered me to withdraw my system; which having done, in two days Mr. D. pronounced the mine extremely dangerous; and, although he well knew I had cleared others, he dared me to again clear this; I asserted that I could do it in six hours. The time was agreed on for Monday, June 12, 1809, the examiners named by his Lordship being Samuel Fereday and Richard Smith. On the Sunday evening, however, preceding the day of trial, certain persons, whose names it might be unsafe to name thus publicly, though they are well known to all the people of Dudley, had made in the carpenter's shop a door, by which to closely stop an air-head, with the diabolical intention of destroying myself, and the eight men who were along with me busily employed in accomplishing the means of safety for themselves and their fellow-workmen. Had these infatuated men had the knowledge, as they had the will, the explosion they contemplated would have completely hidden all their misdeeds. Their prosecution, my feelings prevented; but, my Lord, their base attempts, not to mention great ignorance, should disqualify them for any confidential situation.

Possibly your Lordship will recollect the interview kindly permitted me, in 1809, with the Hon. William Ward, at Ashwood House. After facing death in the various forms in which it is presented in the ordinary operations of mining, and satisfied that my system gave me ample controul over the enemy, hydrogen—my fear was not of death, as the common lot of all, but of falling a victim to the machinations of the assassin. I repeated what I had stated (in 1806) on the Tyne, that "all lives lost in mines by explosions of carburetted hydrogen, are a wasteful and profligate expenditure." My favourite system, to secure safety to the collier, I entreated, whatever might happen to myself, should have a fair and full investigation. The answer, given on his honour, was literally, "Ryan, whatever may happen to yourself, a full and fair investigation of your system shall take place." My *Lord, the time is* now arrived, when humanity claims from your Lordship the fulfilment of this promise.

At that time, the expense of raising coal on the Tyne was about 8*s.* per chaldron, yet your Lordship's father paid for the like quantity 23*s.* as your colliery-books will prove; thus undeniably showing that the accumulation of hydrogen causes the high price, as its absence brings on a low price, of coals. The coals then got from some pits, when sold at 8*s.* per ton, did not cover the expense of quarrying; while in the non-explosive mines only about 5*s.* were paid per chaldron. Look, my Lord, at the present state of Netherton Colliery. In no instance have I lost by gaseous fluid, life or limb, and, of consequence, have had few or no falls of roofs, &c. The whole bed can be quarried as virgin coal, leaving merely pit-eye pillars, those to support the horse-roads, and any edifice on the surface. Ever since the mines have been freed from the hydrogen, the colliers work with vigour and satisfaction; a new feature is given to the method of quarrying the 30-feet coal, by blowing down masses with gunpowder, without any waste of the material in useless slack, and the expense is now about the same as the mines west of Netherton, 7*s.* per 53 cwt. The same may be asserted of the Buffery, Hill Top, West Bromwich, &c., mines. And, although your Lordship's agent, Mr. Downing, may wish to induce your Lordship to believe that the saving is effected by his superior modes of managing the great concern, (and no doubt can be entertained of this disposition by any person who has read the certificate, No. 2, of Ryan's Appeal, in the philosophical journals of Europe, a document that has astonished all Europe, and yet remains unanswered),* yet the real

* The following is, we believe, the certificate alluded to in the text:—

"CERTIFICATE, No. 2.—The numerous lives lost in Lord Viscount Dudley and Ward's Collieries by inflammable gas, and the excuses made use of to account for it, left no doubt in our minds as to the fallacy of the system acted upon. Mr. Ryan being employed in 1808 to ventilate the dangerous works, he succeeded beyond our most sanguine expectations, without recourse to the former expedients, which were both expensive and dangerous. Being employed to open new works, he never suffered them to accumulate gas; which made the agents say, that it arose from natural causes. To convince them, Mr. Shirley allowed him (Mr. Ryan) to withdraw his system: in two days the agents reported the works to be so infested with gas, that it would be impossible for Mr. R. or any one else to free it,

cause is as above-stated; and the fact is fully proved by the evidence of Messrs. Beddle and Brandling to the Lords' Committee; and they may be admitted to understand the matter—for the former has been more than thirty years Chairman, and the latter almost as long, the Secretary to the Coal Trade of the Tyne and Wear.

There is cause for regret that your Lordship was not one of the Committee, from your being able and ready to have shown the injurious results of the diluting system, as well in raising the price of coals as increasing the number of explosions. In the few mines of the North, noticed by the record, from 1805 to 1816, or prior to the adoption of the lamp, there were 9 explosions and 284 deaths; and since its adoption, that is, from 1817 to 1828, there were 19, and 360 deaths in the mines, not stating those who died at home of their injuries.

The Mechanics' Magazine is made the medium of this epistle to your Lordship, because it records the scientific knowledge of the millions, and is the greatest work within small dimensions, by which your Lordship can be made acquainted, that truth and justice demand a full and impartial investigation of the best method of raising coal, with safety to the collier; and that it should take place early before a proper number of adequate judges in the metropolis.

My Lord, I have the honour to be,
Your obedient servant,
JAMES RYAN, F.S.A.
Director of Mines.

Middleton Hill Mines, Montgomeryshire,
January 16, 1832.

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without recourse to the former expensive system, which would take some months to execute. Mr. Ryan then engaged to clear the works in six hours, and risk his life in the performance of it; which was executed on the 12th of June, to the entire satisfaction of Messrs. Fereday and Smith, who attended to inspect this trial. Mr. Ryan's system is not affected by the weather, and appears well calculated to guard against incendiaries. On the occasion before-mentioned, the agents of Lord Dudley and Ward privately stopped up the air-courses, which, had it been done on the old system, must inevitably have been attended with death. We have no hesitation in saying, that during a course of experiments for two years and a half, in the most dangerous works, without firing-line or any other expensive precaution, he did not lose one life, neither was any one rendered incapable of labour; and the effects of his operations are still visible and evident in the works.

" W. SHIRLEY,
" April 26, 1811. " SAML. FEREDAY."

OXIDATED MAGNETS.

Sir,—Should you think fit to insert the following brief remarks, you will oblige a constant reader and admirer of your highly valuable repository of useful knowledge.

The continental philosophers are continually repeating experiments, which appear very often to be of much more interest to us, as a commercial people, than to themselves. The experiments of Berlocci, Christie, and Zantedeschi, go to establish some very important practical deductions with respect to magnetism; and, above all, that an *oxidated* magnet, or needle, acquires a force or intensity more than double, by simple exposure to the sun's rays.

The following remarks are taken from the *Bibliotheque Universelle*, Nov., 1829:

"My own experiments (says Proff. Zantedeschi) made with every possible care, confirmed all these results. An artificial horse-shoe loadstone, which carried 13½ ounces, after exposure to the sun for three days, carried 3½ ounces more; and, by continuing its exposure, its power increased till it became 31 ounces. It was not possible to obtain greater strength.—Experiment proved, that, whilst by exposure to the sun, the strength increased, in oxidated magnets, it diminished in those which are not so, but that this diminution became almost insensible when the loadstone was polished, so as to reflect light like a mirror. A loadstone, indeed, not oxidated, which carried eight ounces, being exposed for three hours to solar light, lost 2½ ounces of its strength, whilst another oxidated loadstone similarly exposed, gained as much, and even more strength; but, having polished the first like a mirror, I could not observe any perceptible variation, though its exposure to the sun was greatly prolonged.—I have observed oxidated magnets acquire an energy double of that which they had previously, which did not take place with those whose surface was clear."

See also Dr Brewster's excellent Journal of Science, for July, 1830, p. 76.

These remarks may suggest a practical hint of the first importance in magnetism, or rather in the manufacture of magnetic needles; that is, to expose them, much oxidated, to the solar rays, till the greatest strength be acquired (and which, it appears, may be more than doubled) then, to give them a high polish, by

which their strength or *intensity will be retained.*

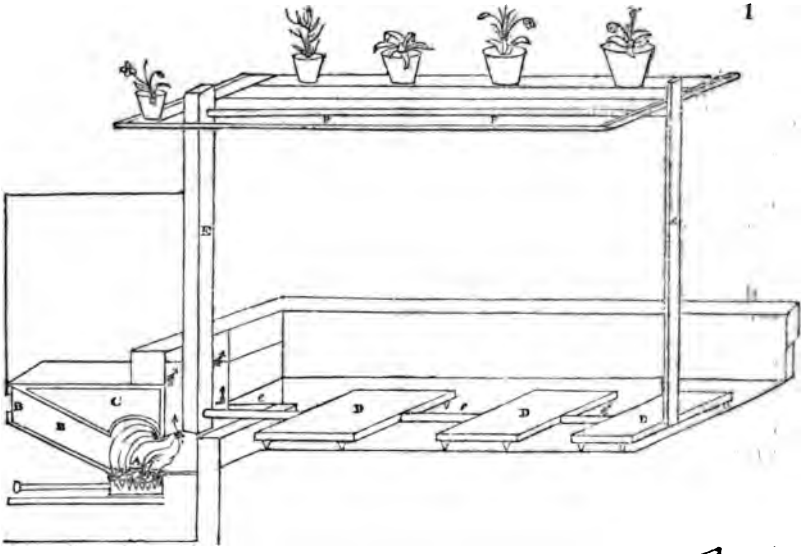
The authority of the fore-named professors is undoubted, yet nothing of this sort should be taken *on credit*—especially in matters pregnant with *practical* results of so great importance to the commercial world. I would suggest, that the surface of the magnet be moistened with a dilute mineral acid to facilitate the oxidation.

I am, Sir, &c.

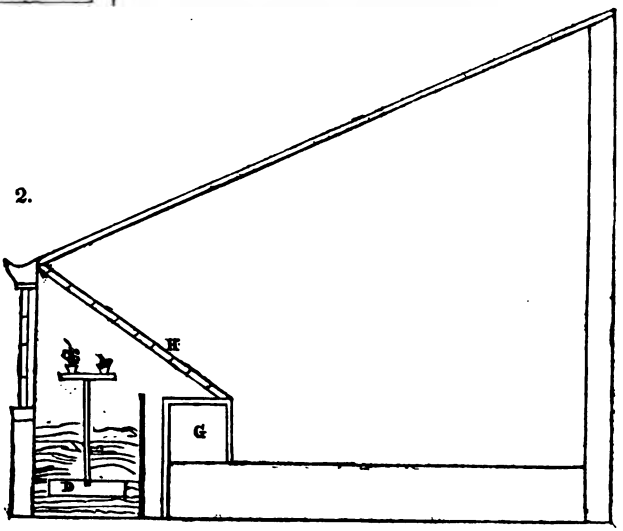
J. HANCOCK.

IMPROVED APPARATUS FOR WARMING BY HOT WATER.

1



2.



Dear Sir,—In vol. viii. of the Mechanics' *Magazine, p. 393,* you gave a design by me of square conductors for the hot water in warming hot houses, and it

was partly copied into the Gardeners' Magazine, with some commendatory observations by the Editor of that Journal. I presume, therefore, that you will consider the following improvement on that design worthy of an early place in your pages. It differs from every thing I have yet seen, and seems to me to offer many advantages.

Fig. 1 is a perspective view of a heating apparatus, as thus improved. A is a sliding grate, which is drawn out by the handle attached, and as soon as a fire is kindled in it, returned to its place. BB is a passage with an air-tight door, through which fuel is supplied to the fire as wanted. C the boiler, over the ends of which the heated air passes in the direction denoted by the arrows. The platforms DDD are heated by the hot water, supplied from the boiler by means of the conductors *eee*. E is a vertical conductor, which conveys the heated water to the horizontal one at top FF, over which there is a lattice shelf. Plants may be placed on this shelf at the same time that the cucumbers are forcing on the platforms D D D below; and in winter, when there is no dung or earth on the latter, the plants can occupy their place.

Fig. 2 is a section of the end of the hot house, intended to show how the dung and soil are placed on D D D for forcing cucumbers, and the flower pots on the shelf above. G is the smoke flue. H a moving glass frame, by means of which the heat may be excluded from the vines, when that is thought expedient.

I remain,
Dear Sir,
Your obedient servant,

M. SAUL.

Lancaster, Jan. 29, 1832.

MR. PERKINS' NEW IMPROVEMENTS IN GENERATING STEAM.

Mr. Perkins has recently taken out a patent for certain improvements in generating steam, founded on a new law of nature of which he claims the discovery. A paper by Mr. P., explaining the whole affair, was read before the Royal Society on the 3rd inst., and that paper we shall now proceed to lay before our readers. We are afraid *Mr. P. has again deceived* himself on the point of novelty; but shall be glad to find we are mistaken.

In the year 1823, I commenced a series of experiments, on the generation of highly elastic or compressed steam.

At the commencement of these experiments, I was impressed with the importance of keeping the water, which was to be converted into steam, in close contact with the heated metal, in which it was contained, having observed, that water on the surface of fluid iron was very little affected by its heat; although the same fluid metal, if made to fall upon the water, would explode with a much greater force than gunpowder when ignited.

This remarkable fact dwelt forcibly on my mind, and urged me to try experiments of several kinds, and modified in various ways. I would mention the two following as the most important of the many experiments which I made; since they afford a convincing proof, that much yet remains to be done in the formation of steam.

The *first* experiment was that of heating, to a white heat, a massive cast-iron cup, and, whilst it was allowed to cool gradually, to place in it several measures of water in succession, as soon as each previous measure had evaporated to dryness. The following was the result:—

	Seconds.
The first measure evaporated	90
The second	80
The third	59

At this third evaporation, the vapour, or steam thrown off, began to appear, and became distinctly visible during the evaporation of the succeeding measures of water.

	Seconds.
The fourth measure evaporated in	30
The fifth	20
The sixth	12

The seventh measure exhibited what I term the *evaporating point*—it evaporating suddenly in a dense cloud of steam:—

	Seconds.
In	6
The eighth measure evaporated in	10
The ninth	20
The tenth	32

and the ninth measure did not boil.

The first measure of water, although

contained within the iron cup, when at a white heat, was perceptibly not in contact with the metal, but was repelled from it to some distance, in a state of buoyancy, and there moved freely in every horizontal position.

So circumstanced, the water evaporated slowly; but when, by the evaporation of successive measures, and the consequent lapse of time, the iron cup cooled down to the *evaporating point*, the water then evidently came in contact with the iron cup, thereby causing an augmented rate of evaporation, in the proportion of 90 to 6, or as 15 to 1; the rate being increased or multiplied fifteen times—or, in other words, a given quantity of water became converted into steam fifteen times quicker, at a moderately low, that at an intensely high degree of heat.

The second experiment was, that of preparing two cast-iron massive cups, cast in the same mould, and weighing about twelve pounds each; from the bottom of one of these cups, ten sharp-pointed spikes were made to project vertically, two inches in length, and a quarter of an inch broad at the base.

These two cups were heated equally to a white heat, when into the cup without the spikes, one measure of water was poured, whilst into the cup furnished with the spikes four equal measures of water were poured. The result was, that the one measure of water which was placed in the cup without the spikes, and the four measures of water which were placed in the cup with the spikes, disappeared at the very same instant of time.

It was observed, upon taking from the fire the cup having the spikes therein, that the upper extremities or points of the spikes were instantly cooled down below the evaporating point, whilst, at their base, the metal was at a white heat; thus proving that the evaporating point must have been found at some intermediate space between the two extremities of the spikes.

Many modifications of this system of evaporating were made, with the view to its adaptation to some useful purpose.

During the progress of these experiments, practical difficulties continually presented themselves; but at length an idea occurred which led to the following result:—

I had observed, if one vessel filled with water were placed within another vessel also filled with water, that the contents of the outer vessel might be made to boil, and that with the utmost rapidity, without the smallest steam-bubble being formed in the inner vessel. The cause of this result appeared to be, that a vast deal more heat had been taken up by the outer column, than by the inner column of water; yet, be it remarked, the thermometrical temperature of the water was the same in the two columns.

The heat required to generate any atmospheric steam in the inner column, could not, of course, be obtained from the outer column: here there must be more or less difference in the specific gravity of the water in the two columns, and that in proportion to the quantity of steam generated in the outer column.

To take advantage of this illustration of a law of nature, a cylindrical tin vessel was made, twelve inches in diameter, and eight inches in depth, with a tube three inches in diameter, and eighteen inches deep affixed to its base at the centre. This tube was open at the top internally, and closed at the bottom. An inner tube, open both at the top and at the bottom, was placed inside the three-inch tube, supported upon legs about one inch from the bottom, leaving a space between the two tubes of above a quarter of an inch all around.

After filling the two tubes with water, the vessel was placed on a furnace of intense heat, leaving the tube completely immersed therein; when, the water in the inner tube, and the water which was mixed with the steam in the outer tube, soon beginning to circulate, there was produced a most rapid generation of steam; for the water in the outer column, taking up the heat as rapidly as it was given off from the fire to the metal, the current in its upward course, swept off the bubbles of steam at the instant of their formation. Such indeed was the force or power of the upward continuous circulating current, that it carried with it substances of varied kind, which ultimately were driven to, and rested on the enlarged base of the cylindrical vessel where the water was quiescent.

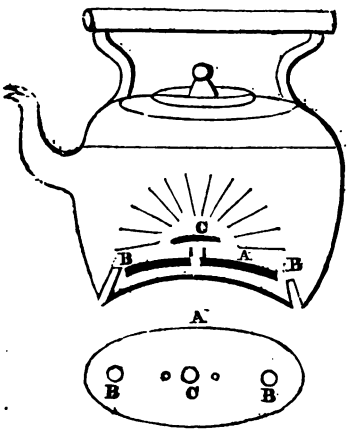
These experiments have fully demonstrated, and that by the unerring law of nature, the important point before alluded to—namely, that of keeping water

in close and undeviating contact with the heated metal in which it is contained, and that at the exact evaporating point calculated for the generation of steam, unattended by those numerous inconveniences incident to the present system.

The object of this paper has not been to enter into a detailed statement of the purposes to which this new system of generating steam may be made subservient, but simply to endeavour to explain the law itself, and the circumstances which led to its discovery, assured that the scientific mind will quickly perceive its numerous and important application.

After the above was in type, we received a letter from our ingenious correspondent, Trebor Valentine, of Derby, in which he says, "Whatever merit there may be in Mr. Perkins's new boiler, I consider that it belongs to a correspondent of your own, W. H. B., of Wellesbourne, who on the 8th of March, 1830, sent you a description of a steam-kettle on precisely the same principle; which you inserted in your Magazine of the 19th of April, 1830, nearly two years before Mr. Perkins's discovery was heard of." On referring to the communication alluded to, we find it fully bears out T. B. in his statement; and us also in the doubts we entertained on the subject: but that the public may judge for themselves, we shall here republish the whole article, which happens, fortunately, to be a very short one:—

"STEAM TEA-KETTLE.



"Sir,—*Having found that in all cases steam forcibly introduced into the lower* parts of a vessel of water, would heat the water in it quicker than a strong fire, applied externally to the vessel itself, I beg to send you a description of a boiler or kettle of simple construction, which boils in about half the time that otherwise would be required.

"I am, Sir,

"Yours, very obediently,

"W. H. B.

"Wellesbourne, March 8, 1830.

"A, a second concave metal bottom to the boiler. BB, apertures for the admission of the cold water C, vent for the heated steam."

"THE EMIGRANT'S POCKET COMPANION."*

This is by far the best work which the painfully interesting subject of emigration has yet called forth. Nowhere else have we seen the inducements and the disuasives to expatriation treated in so fair, shrewd, and discriminating a manner—with so much knowledge of men's capabilities and wants—or with so pure and earnest a desire to serve those whose future fortunes are involved in the issue. Mr. Mudie begins with showing what emigration is, and what are the interests to be attended to by him who emigrates. He designedly avoids entering on the general question, whether it is a good way of relieving distress in a country to diminish the number of useful hands in it (though by his way of stating the case, he shows pretty clearly how his opinion inclines); and for this very satisfactory reason, that it is absurd to suppose, the good of a country can ever form any part of a man's motives for leaving it. The question which every intending emigrant has to put to himself, is simply this: "Shall I better myself, or shall I not?" Of the feeling called "love of country," the author speaks with an approving warmth, that may bring the tear to many an exile's cheek; but he contends, that it ought to have no farther influence on the determination of the question proposed, than this:—that as the new country can have no equivalent in kind to offer, "therefore, the equivalent of personal advantage should be somewhat increased as a

* The Emigrant's Pocket Companion; containing What Emigration is—Who should be Emigrants—Where Emigrants should go—A Description of British North America, especially the Canadas—And Full Instructions to Intending Emigrants. By Robert Mudie. 276 pp., 12mo. Whittaker and Co.

compensation for the loss."—"The only proper love which a man deliberating about emigration should have, or can exercise rationally and safely, is the love of himself, of those who are to accompany him or follow him, or of those whom he expects to meet in the country to which he is going." The "description of persons who have the greatest probability of being benefitted by emigration," is treated of at large; and very consoling it is to find that they are precisely those "whose removal, if not a gain, will be the least loss possible to the country which they leave." The whole of the chapter on this head is admirable, and ought to be read and well digested by every person who contemplates making the experiment of emigration. We select for example, two or three passages which are particularly deserving the attention of our mechanical readers:—

"No man is fit for being an independent emigrant, or even existing at all in a new country, who is not both able and willing to work. He must have health, he must have strength, he must have perseverance, and he must have more consideration than is necessary in an old country, where labour is divided, and every man has his little department marked out for him by the general arrangements of society. He must not only be able to turn his hand to many things, nay, almost to every thing he may require; but he must feel that he is in possession of that power, otherwise he will be in a state of perpetual apprehension, and quite unable to get on." * *

"After the natural capacity and disposition of the emigrant, the next consideration is—What he has been accustomed to do? and this is the point upon which a comparison of the circumstances of the new country with those of the old one, is essential to a clear understanding. It is because the old country is one of highly improved manufactures and efficient machinery, and a minute division of labour by means of which the manufacturing individual has his whole attention confined to a single object, and so learns to accomplish that object probably ten times as well, and in one tenth of the time that he would require if he were always shifting from one thing to another—it is just because that is the case, that the whole country has a surplus of labourers; and, of course, the labourers that it can spare, are those who are the worst adapted, *and, therefore, in the least* demand for its *own operations. In England*, the man *who punches the eyes of needles*, or puts on heads of pins from year's end to year's end, is better adapted for the system of England, than the man who could cultivate two or three acres of land, and make all the rude tools necessary for its cultivation. But a man who could only punch the eyes of needles, and put on the heads of pins, would be of no use whatever in a country where the houses are probably twenty miles from each other, because there could not possibly be any employment for him. In all the nicer manufactures, and especially in those in which expensive machines are employed, and which, consequently, cannot be carried on without a crowded population, and an extensive and ready sale, in the management of which the merely operative workman should have no concern whatever, to distract them from their individual pursuits—the workmen are a proper part of the system of a highly improved country; and, generally speaking, it would be imprudent in them, even for their own sakes, to remove as workmen to any country excepting to one in a higher state of improvement than that which they left. As foremen, or instructors, they might go to one a little behind that which they left; but even in those cases, they would be less valuable as labourers; and whether they made up the same value or not, would depend on their efficiency in their new character of overseers or instructors. The range to which the manufacturing population are excluded from the list of advantageous emigrants by this means is very wide; and it may be said to include all those trades which are supported by the staple manufactures, and the peculiar customs and habits of the state of society in the country at home. As, for instance, the various classes of workers in metals; the various classes of workers in wood; the various classes of shopkeepers, dealing in particular commodities; and the various classes of workers in leather; and in all other things, the whole of which are done better and more cheaply in consequence of being portioned out among many hands. Very few handicrafts of any description are wanted in a new country, and of the few that are, each man must be capable of exercising all the departments of his province of the craft, and even occasionally turning his hand to some of the others. An emigrant smith, for example, should be a smith of all work; and besides making or repairing the iron part of a tool or implement, he would be all the better if he could fashion the timber also. With all others the case would be exactly the same—they would be of no use, as capable of doing some single operation nicely, but as they could do a number of

operations even tolerably; and a man who could begin and finish the clumsiest imaginable house, so that he made it only dry and warm, would be of ten times more value than the most skilful architect or the neatest handed carver. Considering the country as perfectly new, there is in fact no use whatever for artizans, or people who are skilled only in the process of manufacturing; and whatever distress they may be occasionally subjected to by the fluctuations of business, emigration cannot in any way be made a means of relief *to them.* * * * * There is one other argument respecting the emigration of mechanics to new countries, which it may not be improper just to mention, although that which has been stated is in itself conclusive. Mechanics are accustomed to confinement to within doors, they are in consequence ill adapted for enduring fatigue and exposure in the open air; so that even if we should suppose them capable of soon acquiring skill enough for all the operations called for by an emigrant, they must be considered as deficient in muscular power and hardiness. Taking this argument in conjunction with the other, it may be considered as an established principle, that mechanics ought not to emigrate to a new country, because they would have to forget all they have learned, and to learn from the beginning all that they had to do, with constitutions and habits unfitted by their former occupations, both for the learning and the practice." * * * —pp. 40-46.

Who, then, are the parties that should emigrate?

"Occasional labourers—those who have been obliged to work at any thing for which they could obtain even a small remuneration—who have been inured to cold, scanty clothing, poor food, and comfortless dwellings—who have little to lose or regret, and every thing to hope from the change—are the very persons who should emigrate. As they have nothing to regret, so they have little to unlearn; as they have borne privations where there was no hope for them even in prospect, so they can better meet the privations to which they must be exposed in the adopted country; as they have been accustomed to do for themselves with very little of the help of professional or tradespeople, the transition will not be very great to them from England to a place where such help is not to be found. * * * Along with the labourers who are occasionally out of employ, may be classed *those cottage farmers who are in daily apprehension of being so, in consequence* of their inability to take their part in the improvements that are making around them. * * Who have fallen from the respectability which their fathers held, and who fear, and indeed feel, that their children must fall from the little remnant which they themselves hold; to whom every view, in which the present or the future can appear, is gloom—not easily to be borne, and sufficient to damp their spirits, and destroy any effort that they might be able to make to regulate their station. There are many families so situated, who still possess enough to transport them to a new country, and to keep them there till they have learned its customs and its ways, and become able to support themselves comfortably in it; not only that, but to rise faster to independence and comparative affluence than they had in the bitterness of their fears, dreaded that they would sink to utter misery and dependance in the old country. To such persons, the mere change is a source of relief and hope. In the new country they would be, as it were, at the head of society; and that is, in itself, one of the most stimulating incentives towards rising higher. It is clearly for the interest, the very best interest of all who are thus situated, to emigrate; and, perhaps, they are about the highest class of persons that can, with advantage, go to a country that is entirely new—that can sit down in the wilderness satisfied with their own society, with the full determination of turning that wilderness into a profitable and pleasant heritage."—Pp. 51-55.

The point next discussed by the author is the country which an emigrant should select; and the result of a great many considerations on this head is, that the best country for a free emigrant—that is, an emigrant who is free to move where he pleases, and at the same time free from prejudice—to go to, from any part of the British Islands, is the British Colonies in North America. Mr. Mudie agrees in this with Bouchette and M'Gregor, and indeed with nearly all the recent writers on emigration.

A geographical sketch of British North America, and an account of its climate, soil, and productions, form a suitable sequel to the preference thus awarded to it. It has been compiled with care, but presents not much that is new.

A concluding chapter is devoted to the "Means and Mode of Emigrating." Mr. Mudie appears here again in his own person; and perhaps nowhere more to

the advantage of his reputation, for sagacity and knowledge of the world. We feel greatly tempted to add to our extracts the whole of his "Preparation for the Voyage," but can only find room for one other brief quotation:—

"Another very useful preparation is the materials of a mimic log house. A bundle of sticks may be had for a few pence. When the emigrants are on board, the men, and especially the boys, will find something more than amusement in cutting them of the proper lengths for sides and ends, notching them when they cross the corners, piling them up, making a roof, and so finishing a miniature habitation. Plain models of houses, and the more necessary instruments used in the settlements, would make excellent additions in every emigrant's ship; because by the assistance of them, a clever emigrant might have all his new trades half learned before he landed; and time, which otherwise is absolutely lost, would thus be applied to the most useful of all purposes. Even a gnarly piece of wood to exercise the axe upon, is good for keeping the hand employed; and the notion of a Scotchman, having always a knife and stick in his hands, which is ridiculed in English company, is far from a bad one among emigrants."—P. 204.

Excellent, however, as this book is, our concluding wish must be, that never a reader of ours may have occasion for it. We desire this on the same principle that we would recommend a friend with a broken leg to apply to Sir Astley Cooper to mend it; regretting very much the accident which caused the fracture, but rejoicing greatly, that Providence had raised up in our time, a man of such skill in the art of making broken limbs whole again.

Coffin Cranes.—Sir, If Mr. Baddeley will take the trouble to refer to vol. iv. p. 321, of the Mechanics' Magazine, he will see that he has been anticipated in the plan which he supposes himself to have invented. E. G.'s machine is the same as that of Mr. B.'s, only that the latter is more embellished; and endless screws introduced for a pinion and wheel. I hope Mr. B. will excuse me for making these remarks, as my only wish is that E. G. should not be deprived of any merit that belongs to him. I am only doing for E. G. what Mr. B. has himself done for others of your correspondents (though in a much cleverer manner) when in danger from such "unconscious appropriations."—I am, Sir, one of your earliest readers and subscribers, RESURGAM.

Railway Dispatch.—The facility which the railways afford for the conveyance of troops was exhibited in a very striking manner last winter on the Liverpool and Manchester Railway. A regiment of *800 men* was conveyed on an emergency, with all its *baggage, from Manchester to Liverpool, a distance of 31 miles, in two hours*; and shipped in an hour *after their arrival for Ireland.* An equally remarkable case of the same kind occurred in the United States. A body of refractory workmen in the employment of the Baltimore and Ohio Railway Company, were preparing to destroy some distant and important works, when they were surprised and made prisoners by a party of militia from Baltimore, who were collected and conveyed to the scene of action by the railway, fully armed and accoutred, in six hours from the departure of the express requiring their aid.

Railway Accidents.—It has been proved, in the course of the Evidence adduced before the Committee on the London and Birmingham Railway Bill, that though 700,000 persons were conveyed on the Liverpool and Manchester Railway in eighteen months, there was but one accident attended with loss of life; while during the last twelve months, the Manchester papers have recorded fifteen cases of coaches being upset in the surrounding district, and passengers by them, being either killed or seriously wounded.

Routree's Improvement in Steam Engine Valves.—Sir, I certainly am not aware of any thing that can compete with the cock in simplicity of action, as well as of construction; nevertheless I had no idea but that it had long since been entirely exploded owing to the utter impossibility of keeping it steam-tight. I was, therefore, not a little surprised at seeing a modification of it set forth in your pages, as an improvement on steam-engine valves; for I cannot consider as any thing else but a cock, both in principle and action, the scheme of Mr. Routree, vol. xvi., p. 377, to prevent the condensation of a few inches of steam at each stroke. He will find, on experiment, the saving by no means commensurate with the loss occasioned by the extra power, requisite to give motion to such extended surfaces; even on the supposition that it were possible to keep them in order.—I am, &c., TREBOR VALENTINE.

Discovering Impossibilities.—M. Mathulon, a manufacturer of stuffs at Lyons, once announced that he had discovered the quadrature of the circle and the perpetual motion, and he deposited 1000 crowns, to be awarded to any person who should prove that he was in error. M. Nicole effectually did this, and the thousand crowns were awarded to him, and were presented by him to the General Hospital at Lyons.

INTERIM NOTICES.

The Supplement to Vol. XVI. with a Portrait of Baron Dupin, is now published, price 6d.; also the Volume complete, in boards, price 8s. 6d.

Owing to the absence last week, through indisposition, of the usual corrector of the press, and the Editor's not being early enough apprised of the circumstance, the mathematical article by our esteemed correspondent, Mr. Scott, on Lieut. Drummond's principle of representation, was, in nearly the greater part of our impression, given so very inaccurately, that we see no other way of repairing the injustice done to the author, but by reprinting it anew in this day's number.

Mr. Saul's communication of the 3d inst. shall have an early place.

Thanks to M. T. for his friendly suggestion, which shall be forthwith attended to.

Communications received from Mr. Deakin—O.—Mr. Baddeley—Americanus—Mr. Hicks.—P. M.—A Constant Reader—Mr. J. E. Wall.

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

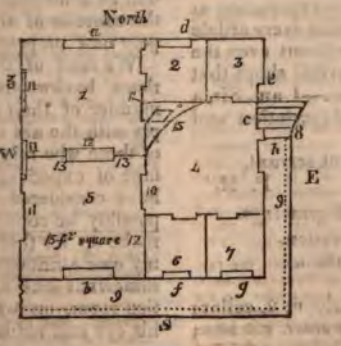
No. 458.] SATURDAY MAY 19, 1832. [Price 3d.

TEMPORARY COTTAGE FOR AUSTRALIA.

Fig. 1.

Fig. 2.

Fig. 3.



A TEMPORARY COTTAGE FOR AUSTRALIA.

Mr. Editor,—In the hope of some builder taking up the subject, and informing the public at what price he can furnish such a cottage as that represented in the prefixed sketches, *quite complete*, or ready to step into, I am induced to trouble you with these few lines. The frame-work of the cottage is to be taken to pieces; and I propose that it shall be afterwards covered with a composition of tow, tar, and finely-pounded glass powder, made into thick boards, such as are used by book-binders. The several advantages of which will be undisputed; such as cheapness—lightness for exportation—durability—and ornamental capabilities, if cast into moulds and painted, as all can attest who have seen the beautiful Corinthian columns in the Protestant chapel at Versailles, *made of paper*. Such a composition not being brittle, would be preferable to Paris casts, and being mixed with pounded glass, would be imperviable to rats and mice. If warping be feared, let the sun on those parts exposed to its rays be excluded by hanging a well-tanned canvass curtain from the extremity of the roof, which would draw round the house a current of air that would be most agreeable. The boards may be put up by a common labourer in the course of a few hours, and then painted. For the interior of the house, paper of a superior kind might be made to admit of any of the most beautiful ornaments that could be designed. Whether these boards would likewise serve for covering to the house, or for flooring, I cannot determine, but think it might be readily contrived.

Thus in London we might have a cottage ready to pack up for exportation *as is a dressing-case*, containing every article that could be required without even the trouble of going to the several shops that usually supply such stores.—I am, Sir, a sincere well-wisher to exportation and colonisation, and

Your obedient servant,
P. M.

Explanation of the Engravings.

Fig. 1. South-front elevation.
Fig. 2. West-end elevation.
Fig. 3. Ground-plan.

No. 1, bed-room, or parlour; 2, cellar; 3, back-kitchen; 4, principal kitchen; *5, eating or bed-room*; 6, dairy; 7, larder; 8, steps from 9, the balcony; 10, a door, or opening into the kitchen; 11, door-ways, that may be afterwards opened when the west end of the house is added to; 12, folding-doors; 13, a partition, that may be taken away to make one large eating or dining-room; 14, fire-place; 15, stove, &c., with a copper. *a b c*, are windows; *d e f g*, window-blinds—jealousies; *h*, the kitchen-door; the roof, it will be observed, is a double one for the sake of a current of air. The dots round the balcony denote where the iron rails will be placed, leaving room on the outside for flower-pots to be ranged. When the house is finished, the steps will be in the middle of the south front. The balcony should be more than four feet wide, to allow of seats being placed in it. When the boards begin to decay, the interstices of the frame-work might then be filled up by a wall, a brick and a half thick—that being the depth of the frame-work.

PORTABLE WOOD FELLING MACHINES.

Sir,—As the first operation of the thousands who are annually migrating to the backwoods of America, must of necessity be to fell the timber trees, it has occurred to me, that if a machine for that purpose could be constructed whereby the manual labour may be lessened, it would be an important advantage to each family, and I am confident that in the benefit thus rendered, no one would rejoice more than yourself. I am not an engineer, and therefore cannot judge of the power requisite for the above purpose, but among your numerous scientific correspondents, I have no doubt there will be some who will feel a pleasure in the exercise of their talents for the purpose now proposed.

We read of the prowess of the American backwoodsmen, and the expert manner of their clearing the lands simply with the aid of the axe; but as many of those who migrate have not the advantage of experience in those operations, I have considered that a machine might possibly be constructed so as entirely to make up for that deficiency. I estimate my own abilities at a very low standard, somewhat like a bye-stander in an auction room, on whom the upholder fixes his eye and requests a bidding by way of commencement; as such, I propose a

machine to be constructed on the principle of the common jack for roasting meat (except the line and weight) and instead of the fly wheel, to substitute a circular saw of four feet diameter, the machine to be placed in a frame with two grooves, and impelled forward by a screw which might be worked by a child. The frame should have projecting axles for attaching wheels, for the purpose of moving it from one situation to another.

It is presumed the machine could not be made to cut lower than four feet from the ground.

I am, Sir, respectfully,
Your obedient servant,
J. HOUNDS.

April 21, 1832.

[We recommend the preceding communication to the favourable consideration of our inventive mechanics; it points out a want which might, we think, be very easily supplied. Another correspondent (M. T.) has directed our attention to a paper in the Horticultural Register for May, 1832, which is very germain to the present matter. It is there stated, that the Duke of Athol has erected machinery in various parts of his woods for converting the smaller timber. One saw mill in particular is worked by a mountain stream, and so admirably constructed that the edifice and machinery may be taken to pieces with very little trouble, and removed to any other place where it may be wanted. The expence of erecting an effective circular saw where it may be necessary to make the water-wheel, will not exceed forty pounds. M. T. states that a "Mr. Murphy has erected a working model with some improvements at his place, North Frederick-street, Dublin, and will be glad to show it;" and, he thinks, "Mr. Ross, the intelligent gardner, at Dunkeld, will be equally disposed to satisfy inquirers." We shall make application to both these gentlemen on the subject; and hope, through their kindness, to be able ere long to lay before our readers a particular description of the machine, and of the improvements alluded to.—Ed. M. M]

ON THE NATURE OF COMETS.

Mr. Editor,—Having read in No. 456 of the Mechanics' Magazine, the opinions expressed by your ingenious correspondent, J. F., on the nature of comets, and deeming that his conceptions of those bodies, instead of *farther harmonizing the beautiful theory of our solar system*, would be calculated to confuse it, I beg to offer the following observations in answer to them.

It is first imagined by J. F. that a comet is a globe, which, having stood its appointed time, is undergoing a purification by fire; and that our own is fast approaching the same result, and will put on a similar appearance, to the inhabitants of other worlds. We must, then, suppose the comet to be fired exteriorly by the superior power of the sun, which J. F. justly allows can illuminate only the half turned towards that luminary; the rays of light can then only be thrown from its enlightened side. What becomes of the tail? Supposing a comet to be fired from its centre, the effect produced would be naturally that of a tremendous earthquake, blowing the world to atoms. If, by some unimaginable cause, J. F. conceives the entire body of a comet to be emblazoned, its amazing vividity would be such as to prevent the distant rays of the sun from hiding the emanations proceeding from itself; and it must be remembered, that it is night when we view a comet, so that the sun could not at such time hide its rays from us. We all know the quickly-consuming character of fire; that it requires matter to supply it, which it devours, and that consequently the nucleus of the comet if not entirely extinct, would be greatly reduced ere it reached its aphelion or extreme distance from the sun. It is, then, only reasonable to suppose, that when there would be less substance to burn, added to increased distance, the tail would appear less. *It is the reverse!* J. F. considers the peculiar orbits of comets to be caused by the medium of fire, having driven them from their circular revolutions around the sun. This idea cannot, for a moment, be adopted by modern astronomers; the harmony of the Copernican system being such, that one globe cannot be displaced from its situation without disturbing the admirable arrangement of the whole. It is an undoubted fact, that when a comet is near to the sun its tail is short; travelling farther, it becomes longer, and at its aphelion the tail appears longest, gradually decreasing as it approaches the sun. Does not this clearly prove the sun's influence on such appearances? It may be said the effect is evident; but what is the cause of the tail appearing longest,

when the comet is at the greatest distance from the source of light? I answer, its elliptical orbit; when near to the sun the borrowed light which it receives is cast on its surface in an angular direction, and the rays (which are consequently partial) spreading o'er its atmosphere, enable us, moving in a circular orbit, to perceive the comet with its appearance denominated a tail; as it increases in distance, the light travelling from the sun less angularly, the tail is lengthened, and upon arriving at its aphelion, it is in a direct line with the eye of day, and receives light from every part of it; the tail may then be viewed at its greatest extent by the inhabitants of the earth. I shall feel great pleasure if the preceding remarks be thought sufficiently explanatory; and I cannot believe that our omniscient and merciful Creator would form worlds to destroy them; for by the destruction of our globe, as prophesied by J. F., that of the moon would certainly follow, and the whole system be disarranged. For vegetative purification the Almighty has given every resource; for mental he has taught us to look into ourselves.

I am, Sir, yours, &c.

JOHN EDWARD WALL.

84, Dean-street, Soho, May 7, 1832.

PROGRESS OF STEAM NAVIGATION IN AMERICA.

WHOLE NUMBER OF STEAM BOATS BUILT ON THE WESTERN WATERS (OHIO.)

(From the American Almanac for 1832.)

When built.	Whole No.	Now running.	Lost or worn out.
1811	1		1
1814	4		4
1815	3		3
1816	2		2
1817	9		9
1818	23		23
1819	27		27
1820	7	1	6
1821	6	1	5
1822	7		7
1823	13	1	12
1824	13	1	12
1825	31	19	12
1826	52	36	16
1827	25	19	6
1828	31	28	3
1829	53	53	
1830	30	30	
1831	9	9	
	348	198	150

	Of the boats now running,
68	were built at Cincinnati,
68	- Pittsburgh,
2	- Louisville,
12	- New Albany,
7	- Marietta,
2	- Zanesville,
1	- Fredericksburgh,
1	- Westport,
1	- Silver Creek,
1	- Brush Creek,
2	- Wheeling,
1	- Nashville,
2	- Frankfort,
1	- Smithland,
1	- Economy,
6	- Brownsville,
3	- Portsmouth,
2	- Steubenville,
2	- Beaver,
1	- St. Louis,
3	- New York,
1	- Philadelphia,
10	- not known where.
198	

Of this whole number, 111 were built at Cincinnati, 68 of which were running in 1831.

Of the 150 lost or worn out, there were

worn out - - -	63
lost by snags - - -	36
burnt - - - -	14
lost by collision - -	3
lost by other accidents not ascertained	34
Total -	150

STEAM BOATS ON THE MISSISSIPPI.

(Also from the American Almanac for 1832.)

St. Louis is 1200 miles by the course of the river above New Orleans, and is next to that city, the largest and most commercial town on the Mississippi. In the summer of 1831, there were 6 steam boats regularly employed between St. Louis and New Orleans. A trip from one place to the other and back again, usually occupies 24 days; the shortest time in which one was ever made, 18 days. The usual fare for cabin passengers descending, 20 dollars; ascending, 25 dollars; for deck passengers, 5 dollars, either way. Freight per 100 lbs.:—descending, 37½ cents; ascending, 62½ cents.

From St. Louis to Louisville, 630 miles; 6 boats regularly running, in 1831: usual time of a trip, 10 or 11 days; the passage one way usually being somewhat more than three days; fare of cabin passengers about 15 dollars, either way; deck passengers, 4 dollars; freight about 25 cents per 100 lbs. One boat also ran regularly to Cincinnati, 150 miles above Louisville.

From St. Louis to Fever River, about 480 miles; 3 steam boats regularly employed in 1831; time occupied by a trip, about 10 days; fare for passengers, ascending 15 dollars; descending, 9 dollars. The route of one of the boats occasionally extended to St. Peter's River, 400 miles further up.

In 1831, two boats were employed in running from St. Louis up the Missouri to Franklin, 200 miles, and to Fort Leavenworth, 200 miles further; freight to Franklin, 75 cents per 100 lbs.; and to Fort Leavenworth, from 1·25 dollars to 1·50 dollars; from Franklin down, 25 cents per 100 lbs.

From St. Louis to Pekin, on Illinois river, 180 miles; two or three boats regularly employed in 1831. Steam boats come occasionally to St. Louis from Pittsbourg and other places.

STEAM BOATS AND TEAM BOATS IN LOWER CANADA.

(From Bouchette's British Dominions in North America.)

Plying on the St. Lawrence, 16 steam boats, and 4 team boats.

Navigating between Quebec and Montreal, 60 river crafts of 25 to 100 tons burden.

Rate of freight, per ton, 7s. 6d.

Square-rigged vessels on the stocks at,	Montreal,		2
Do.	Do.	Quebec,	9
Small crafts	-	-	2

There are also two steam-boats on the Ottawa river plying between Grenville and Hull, one between La Chine and Point Fortune, and one between La Chine and the Cascades.

LIEUT. DRUMMOND'S PRINCIPLE OF REPRESENTATION.

Sir,—The population of England, being 13,894,000 + taxes £48,268,990
Scotland - - - 2,365,000 + 5,118,383
Ireland - - - 7,734,000 + 4,392,101

Then, 76,757,444 : 658 :: 57,152,990 : = 490
7,478,353 : = 64
15,126,101 : = 104

Population 23,993,000
Taxes - 52,764,444 } = 76,757,444 = 658

It is stated (No. 457) that upon this principle of "the joint ratio of population and taxes,"

England would be represented by 460½
Scotland - - - 64
Ireland - - - 133½

Now, England is	- -	513 — 23
Scotland	- -	45 + 19
Ireland	- -	100 + 4

Therefore, I agree with your correspondent Mr. Scott respecting Scotland only. The Reform Bill proposes for Ireland the number I have stated. Are the taxes fairly stated ?

I have the honour to be, Sir,
Your obedient servant, T.

May 12, 1832.

CONSTRUCTION OF STEAM-VESSELS.

Sir,—The remarks of Junius Redivivus upon the vibratory motion of steam-boats, in your March number, have induced me to offer you the following remarks upon that subject.

There can be no question that most, if not all, the vibratory motion felt on board a steam-boat, is occasioned by the shock of the paddles against the water at the time of entering the fluid.

The vibrations will be more sensible in a slight and weak vessel than in a stout and compactly-framed vessel, and, of course, will cause more injury to the vessel of slight scantling, in a given time, than to the other. The great object in the construction of steam-vessels should be to have them as light as possible, so as to secure the requisite strength for sustaining the continued jarring of the paddle-wheels and engines without injury. The usual mode of giving solidity to ships, and particularly steam-boats, is merely to collect a mass of timber together, having only an accidental connexion by the bolts and treenails, which hold the planks, keelsons, &c., in their places. Let any one examine the longitudinal securities of a steam-vessel, and they will discover that it is the semblance rather than the reality of connexion. The keelson is united by what are technically called hook-scarphs; here the stiffness or capability to resist flexure is reduced to less than one-half the stiffness of the other part of the keelson. The scarphs of the keel being what are termed tabled-scarphs, are better adapted to resist pressure; but, of course, as in the best contrived joints, it is weaker there than in the other parts. If we examine the longitudinal securities at the upper part of the vessel's side, it will be found that although there may be sufficient strength in some parts to resist a longitudinal strain; yet the scarphs will give indications of weakness in consequence of the comparatively slight connexion between the pieces.

In order to obviate these acknowledged deficiencies, and to obtain the greatest degree of strength at the least possible weight, the keel and keelson should be so placed with regard to each other as to form a kind of frame on the principle recommended or invented by the ingenious Mr. Smart, for masts, girders, &c. The difficulty of doing this would be but trifling, and it need not interfere with the internal arrangements, or with the general framing and strength of the vessel in other respects. It is unnecessary for me to enter into minute particulars as to the mode of performing the work—as any one having a general knowledge of the doctrine of forces would be able to perform the work so as to suit the peculiar circumstances of the case.

It has been matter of surprise that the practice of introducing coaks or dowells into the fastenings has not more generally prevailed. For resisting longitudinal or lateral strains they stand pre-eminent over every other kind of fastening, and have the additional advantage, and that not a trifling one, of allowing the faces of the work to be accurately fitted to each other with the least possible trouble. I would recommend their general and more extensive use in the construction of steam-vessels, particularly in the upper works. For instance, by having the wales rather thicker, and only two strokes of them, they might be connected together at the edges by coaks, say 6 or 8 in each plank, and by having a stringer wrought inside opposite them, the wales and stringer might be coaked into timbers of larger siding than the rest of the top-timbers introduced, say every 4 or 5 feet, and bolted through and cleughed. In order to avoid increasing the top-weight too much, the stringer should be in its usual place, close under the beams, and have a coak from each beam, and the wales raised so as to avoid being cut by the paddle-beams, shaft, or ports. I am aware that this arrangement would not meet the taste of many

naval architects of the present day; but surely they ought to recollect that one trait of excellence in machinery or buildings, is their adaptation to the particular purpose for which they are intended with the least complication of parts or arrangements. I am, Sir, yours, &c.

G. BAYLEY.

Ipswich.

[We have received with the preceding letter four sketches, illustrative of Mr. Bayley's ideas of the mode in which greater strength to resist vertical pressure may be obtained; but must defer their insertion till next week.—ED. M. M.]

SAIL-WORKED PADDLES.

Sir,—I beg, through the medium of your useful publication, to say, that I fear the sensible remarks of Junius Redivivus (expressed in your 447th number) respecting the action of sail-worked paddles, are but too correct; for had they been otherwise, there would, no doubt, ere this, have appeared in your Magazine, some account of a successful experiment of a vessel moving direct in the wind's-eye. I will not say that it is impossible to effect it, or that I exactly agree with J. R. in pronouncing it equally futile with the search after perpetual motion, for, I confess I have had gleams of hope, so far as to have imposed upon myself the trouble of making three wind-mills for the purpose of combating with the teeth of old Boreas, but I have always given them up in despair of gaining the victory, and laid them aside to grapple with plans of a more hopeful nature. Still, when I see or hear any thing of the said plan, I feel desirous of learning the results, and had hoped, through your Journal, to have obtained an account of some experiment upon the subject. However, having already explained that I am wanting in energy to make an experiment myself, I have no right to complain, but must be content to remain in the dark.

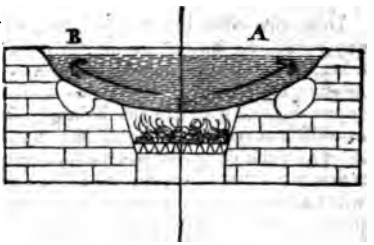
I do not think, if it could be accomplished, that the sailing direct in the wind's-eye could be an object of very great importance in nautical science, because I am certain that no vessel could sail in that direction so fast as a sailing vessel would "turn to windward;" but the fact would be interesting and curious, and attended with some advantages in canals, or where room was wanting to work a vessel in; therefore, the attempt, in my humble opinion, should not be discouraged altogether. The knowing how near the vessel laid to the wind, before the paddles ceased to act, or were jammed hard (to use J. R.'s term) would be interesting. As to the mechanical means to drive the paddle wheels, there is no difficulty about that, and it is not worth the trouble of describing until after an experiment had been tried. As to what your correspondent (A. B. W.) says in your 450th number, about a sail-worked paddle vessel not going *direct* in the wind's-eye, why, she would be worse than useless if she did not possess that quality to its *fullest extent*, as she would in that case be a complicated dull sailing vessel, instead of a simple and fast one.

I am, Sir, yours, &c. H. M. W.

MR. PERKIN'S NEW IMPROVEMENTS IN GENERATING STEAM.

[In our last number, we gave a brief extract from a letter from Trebor Valentine, pointing out the similarity between the form of boiler last patented by Mr. Perkins, and a steam tea-kettle described in this work about two years ago; we now give the whole of the letter.—Ed. M. M.]

Sir,—In the Register of Arts for April, there is an account of a mode of boiling and evaporating, which is the subject of two patents recently taken out by Mr. Perkins, illustrated by three engravings, which, together with the description, are, I suppose, copied from the specification. Considering the patentee to be in error, I must trouble you with a copy of one of the plates, which will be fully sufficient to explain my views on the subject:—



Mr. P. says the heat from the furnace will cause a circulation up the side of the outer vessel, which, passing over the edge of the inner vessel, or machine, the liquid will then descend, taking the course described by the arrow on the side A. Having been taught that heat will rise perpendicular where there is no

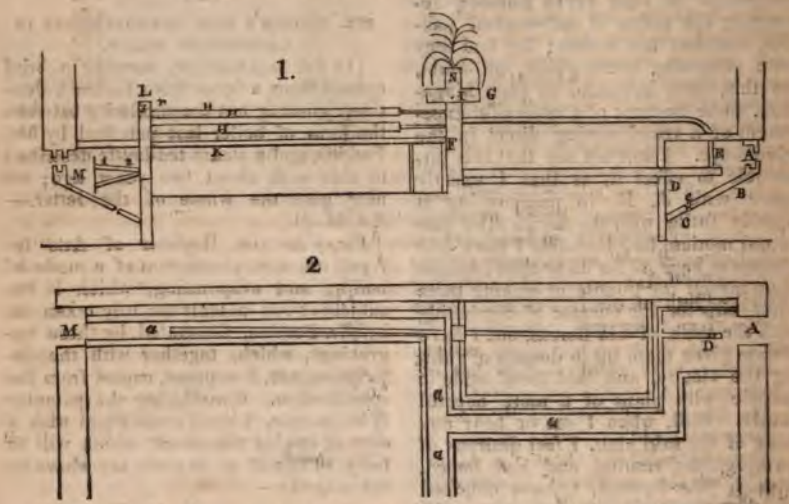
disturbing force, and not being able to overcome the force of education, I cannot conceive but that the circulation will proceed in the contrary direction, as shown by the arrow on the side B, that is, the liquid in contact with that part of the outer vessel which is directly over the fire, becoming specifically lighter by expansion, will rise perpendicularly through the large opening in the bottom of the inner vessel, and spreading over the surface, the escape of caloric by reducing its temperature will lessen its volume, when it will descend in its turn.

Whatever meri l ere may be, however, in this new boiler of Mr. Perkins, I consider it belongs to a correspondent of your own, W. H. B., of Wellesbourne, who, on the 8th of March, 1830, sent you a description of a steam tea-kettle, on precisely the same principle which you inserted in your Magazine of the 19th of April, 1830, nearly two years before Mr. Perkins' discovery was heard of.

I remain,
Sir,
Yours, respectfully,
TREBOR VALENTINE.

Derby, May 8, 1832.

EXPERIMENTS IN HEATING BY HOT WATER.



Dear Sir,—Having not yet met with any published statements of the time it takes, according to any of the plans of heating by means of hot water now in vogue to raise water to the boiling point, at different distances from the fire, I send you the details of some experiments made with that view, which I hope you will think of interest enough to deserve a place in the Mechanics' Magazine.

But first let me describe the apparatus made use of. Fig. 1, of the prefixed sketches, is a section of the apparatus; and fig. 2, a plan of the hot-house in which it is erected. A is a sliding-door through which the fire is fed; B, an inclined plane of cast-iron, 2 feet 6 inches *long by 15 inches broad*; C, the grate, 15 inches by 12. I find that it is of no consequence whether the grate is fixed or movable; as the fire burns at the lower end of the incline, the ashes fall through an aperture at *e*, and more fresh coal descends by its own weight, an arrangement which is attended with the advantage of causing a great part of the smoke to be consumed, that is, converted into heat. D is a transmission-pipe, which proceeds from the back of the furnace, and passes under a bark-pit—inside diameter three inches; E, the return-pipe—inside diameter 1 inch; F, the supply-pipe—inside diameter 2½ inches by 4½ inches; and G, the reservoir. So far I have described but one wing of the apparatus. At the other end of the build-

ing, opposite to A, there is a second fire-place, M, the heat from which is conveyed by two tubes, 1·2, into a vertical pipe, L, from which two horizontal pipes, H H, pass to the central supply-pipe, F. In the plan, fig. 2, *aaa*, are flues, which run into the base-wall.

The object of having two fire-places was, however, merely tentative; and the reader will understand that in the following experiments there was only one fire burning at once. I may observe, by the way, that there is a very curious difference in the effects produced by the two fires. When the fire, M, is burning, the water makes a regular stroke of about 6 inches, like a piston of a steam-engine. I have allowed room for that stroke in the extra space 3 of the pipe, L, which is closed at top; but lest the stroke should by any sudden increase require greater scope, the pipe, N, is left open at top, and the water rising through it in a jet, falls back into the general reservoir, G. Nothing of this kind, however, takes place when the fire, A, is burning; there is no stroke. Perhaps some of your readers can explain the cause of this difference.

The first experiments which I shall proceed to relate were made on the evening of the 15th of April last with the fire, M. There had been no fire lighted during the day. The fire was set at 7 o'clock, when the water was found by the thermometer to be at 83° at F, which is 12 feet distant from the fire. When 20 minutes had elapsed, the heat was found to have increased to 120°. Every 5 minutes afterwards the heat was again taken, and the following results obtained:—

20 minutes	120°
25	132
30	150
35	170
40	188
45	212

On the following evening (16th of April) we tried the apparatus with the fire, A, in the same way, and obtained the following results:—

20 minutes	132
25	140
30	158
35	164
40	174
45	188
90	212

On the 27th of April, we made another set of experiments. At half-past 6 in the evening the fire was kindled with a few shavings and chips, a turf, and 10lbs. of coal. The mercury of a thermometer placed in the centre of the house stood at 64°; when inserted in the water at F, it rose to 71°. The progress of the heating was tried as before every 5 minutes, and the following were the results:—

In 5 minutes . . .	75°
10	78
15	85
20	91
25	104
30	128
35	138
40	144
45	154
50	175
55	188
60	212

A cold north-wind was blowing at the time, and next morning I found the glass hung up in the house standing at 60°.

I hope any of your correspondents who have made similar experiments, or who may hereafter have an opportunity of making them, will favour you with some accounts of them; and I should be particularly glad to learn what time it takes to get water to a boiling heat by means of Mr. Perkins' new boiler, at a distance of 12 feet from the fire.

I am, dear Sir, yours, &c.

M. SAUL.

Sulyard-street, Lancaster,
May 3, 1832.

CHEAP MODE OF ILLUMINATING CHURCH CLOCKS.

Sir,—It is usually understood, that the reason why the church-clocks of London and its neighbourhood generally have not been illuminated at night, after the great convenience of the practice has been proved by experience at St. Giles's, Islington, St. Bride's (Fleet-street), Whitechapel, &c.—is the very great expence of the alterations rendered necessary by the plan which has been adopted. The sum mentioned as necessary for the purpose (not far short, I think, of £100) is indeed not a little startling; and I cannot help thinking that it is far more than need be laid out, if the simplest method of effecting the desired ob-

ject were to be taken; indeed, one would imagine that three or four pounds would be quite sufficient. I here subjoin a rough sketch of an idea for a new mode of clock-lighting, which *seems* at least to promise all that can be required, and certainly must be much less expensive than the very complicated method in present use.

Fig. 1.

Fig. 1. represents the clock-face, which is to be made of glass, painted round the border with the usual numerals: the letters are to be painted in a transparent colour, while the rest of the border, or ground, is to be covered with black paint—opaque, of course.

Fig. 2.

Fig. 2 is the hand, composed of a circular piece of glass, as large as the inner circle of the clock-face, and covered entirely with an opaque mixture, except in one part, where the shape of a clock-hand is to be delineated. This is to be fastened on the usual hand-pivot behind the clock-face, and then all that remains to be done is to light up the gas; when the numerals and the hand will appear, in the dark, of a luminous brightness, quite opposite to the appearance of a clock illuminated according to the present system, by which a glare of light is spread over the whole face, in the midst of which the hands and figures have to be sought for, and can be but dimly distinguished. The expense of the trifling alterations necessary to carry *this* mode into effect, must evidently be so small as not to deserve much consideration.

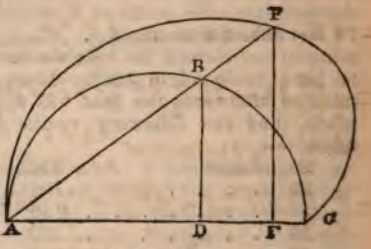
It should be observed, that only one *hand* is used—the minute hand:—the hour is shown in the same manner as in some watches, whereby the figure denoting the hour is always in one situation, and no confusion can arise from mistaking one hand for the other. Fig. 1 shows the hour to be 12, and this is illuminated in exactly the same way, and by the same light, as the rest of the clock-face. It only remains to be added, that a clock thus lighted would be perfectly visible and *legible* in daylight.

I am, Sir, yours, &c.

F. H.

SOLUTION OF THE SECOND MATHEMATICAL QUESTION, VOL. XVI., P. 187.

By G. S.



QUESTION—Let ABC be a given semicircle, draw any chord AB, and draw BD perpendicular to AC; produce AB to P, making AP = AD + DB. Required the area of the curve, which is the locus of the point P.

It is manifest, that when AD = o the curve will pass through the point A, and when AD = AC it will pass through the point C. Let APC be the curve whose area is to be determined. Draw PF perpendicular to AC; assume AC = d, AD = x, DB = y, $\therefore$ AP = $x + y$ and AB

$= \sqrt{d\,x}$, and by similar triangles, $\sqrt{d\,x} : y :: x + y : \frac{x\,y + y^2}{\sqrt{d\,x}} =$ PF, and $\sqrt{d\,x} : x :: x + y : \frac{x^2 + x\,y}{\sqrt{d\,x}} =$ AF; also, $x^2 + y^2 = d\,x$ $\therefore y = \sqrt{d\,x - x^2}$

Hence, by substitution,

$$\text{PF} = \frac{x\sqrt{d\,x - x^2} + d\,x - x^2}{\sqrt{d\,x}},$$

$$\text{And} \quad \text{AF} = \frac{x^2 + x\sqrt{d\,x - x^2}}{\sqrt{d\,x}}$$

Also the fluxion of the area APF $=$ FP.

$$\dot{\text{AF}} = \frac{5}{2}\,\dot{x}\,x - \frac{3}{d}\,\dot{x}\,x^2 + \frac{d\,\dot{x}\,x}{\sqrt{d\,x - x^2}} - \frac{5\,\dot{x}\,x^2}{2\sqrt{d\,x - x^2}} + \frac{3\,\dot{x}\,x^3}{2d\sqrt{d\,x - x^2}} + \frac{3}{2\,d}\,\dot{x}\,x\sqrt{d\,x - x^2}.$$

By integration, we have—1st. the fluent of $\frac{5}{2}\,\dot{x}\,x = \frac{5}{4}\,x^2$. 2nd., the fluent of $\frac{3}{d}\,\dot{x}\,x^2 = \frac{x^3}{d}$. 3rd. the fluent of $\frac{d\,\dot{x}\,x}{\sqrt{d\,x - x^2}} = d$ (circular arc of radius $\frac{1}{2}\,d$ and versed sine $x - \sqrt{d\,x - x^2}$) $= d\,\text{K}$. 4th. the fluent of $\frac{5\,\dot{x}\,x^2}{2\sqrt{d\,x - x^2}} = \frac{5}{2}\left(\frac{3}{4}\,d\,\text{K} - \frac{2\,x + 3\,d}{4}\sqrt{d\,x - x^2}\right) = \frac{5}{2}\,\text{H}$. 5th. The fluent of $\frac{3\,\dot{x}\,x^3}{2\,d\sqrt{d\,x - x^2}} = \frac{3}{2\,d}\left(\frac{5}{4}\,d\,\text{H} - \frac{x^2\sqrt{d\,\text{F} - x}}{3}\right)$. Lastly, the fluent of $\frac{3}{2\,d}\,x\,\dot{x}\sqrt{d\,x - x} = \frac{3}{2\,d}\left(\frac{d}{2}\right.$. Circular area ABD $- \frac{1}{3}\,(d\,x - x^2)^{\frac{3}{2}}\Big)$ *

The above fluents require no correction, because the whole vanishes when $x = o$, also when $x = d$, then $d\,x - x^2 = o$, and the whole area of the curve APC will be $\cdot 6427001\,d^2$.

G. S.

March 1, 1832.

* See pages 237 and 238, vol. 3rd of the Woolwich Course.

THE ART OF BELL-CASTING.

We have been favoured with a copy of "An Introduction," by our intelligent correspondent, Mr. Harrison, of Barton-upon-Humber, to an intended "Treatise on the Proportions of the Constituent Parts of Bells, and on the relative Proportions of Bells of different degrees of Acuteness and Gravity to each other"—the whole being the result of "a course of researches and experiments, continued with much pertinacity during a period of more than thirty years, with little intermission." Mr. Harrison was led into this inquiry from finding that "no aid in the developement of the proportions of bells was to be derived" by the practical bell-founder, from any of the scientific works in which the subject has been introduced. Father Mersenne long ago attempted to reduce these proportions to a system (Harm. Univ. vol. ii. book vii.), and has been copied in the rules he laid down by all succeeding writers and compilers; but for a variety of reasons, with which we need not at present trouble our readers, Mr. H. maintains that Mersenne proceeded on principles altogether inapplicable. Mr. H. (himself a bell-founder) states, that bell-founders "know well by experience that what has been published relative to the proportions of bells is entirely false," and that though many admirable bells have been made, and many good ones are still occasionally produced, nobody has yet been able to furnish the world with the *sufficient reason* why one bell should be better than another:—

"The general mode of procedure seems to have been constantly the same, being apparently coeval with bells, and originated with the primitive bell-founders. And notwithstanding the same method has been followed from that remote period to the present time, it still remains desultory, and as obscure as at first; no better reasons being yet given for the measures assigned to the different parts of bells than that such and such arrangements of their dimensions as have been hit upon by different practitioners, at various epochs, have produced fine tones of such and such notes or pitches of tune."—p. 14.

Mr. Harrison's researches have had for their object to supply this deficiency," and by uniting theory with practice, to render the art of casting musical peals of bells as complete as possible." That great advantages remain to be derived from the lights of theory, Mr. H. thinks

clear, from the following, among other considerations:—

"And though the investigation were an Herculean labour, the great expense of bells renders it expedient that the metal should be disposed of to the best possible advantage. Besides, experience shows, that by the mathematical adjustment of their proportions, bells are susceptible of being rendered equally melodious and delightful as the finest toned stringed-instruments when well tuned. Bells have, moreover, the inestimable property of ever remaining in tune amid all changes of weather whatsoever—the musical intervals still continuing the same, whether hot or cold, wet or dry; and their grandeur and strength of sound surpasses all known music whatsoever, so that their ability is the more general and extensive. Experience also shows that the advantage of scientifically adjusting the various dimensions of bells over the common practical mode of assigning them, is such, that bells cast by the latter method require at least *double* the weight that might suffice to propagate their sounds to *an equal* distance."—p. 20.

The appearance, however, of Mr. Harrison's treatise—the introduction to which only is now before us—is, we regret to say, dependent on the effect which may be produced by the following appeal to the scientific and *campananological* public:—

"It is natural to entertain a desire that that which I have been so indefatigable in accomplishing should be preserved, and which a publication would undoubtedly ensure. Nevertheless, this being the principal work of my life, it ought not to be lightly given away; the recompense ought to be in some degree commensurate to the importance of the matter to the public, independent of the pertinacity with which these speculations and experiments have been continued such a number of years, and the consequent pecuniary sacrifices occasioned by being so completely engrossed by these researches as to forego the advantages which would have otherwise accrued from the trade. Should the learned philosophical societies of different nations, instituted for the encouragement of useful arts and discoveries, with such eminent public-spirited individuals as delight in improvements, be induced to turn their attention to this matter, *the sciences may receive an accession to them.* This *new science*, comprising the elements of the proportions of the component parts of bells, and the relations of *bells of different tones* to each other, which have been hitherto utterly unknown, *may be added to the sciences of Europe.*"—p. 27.

We have a high respect for Mr. Harrison—for his ingenious and original cast of mind, and his very studious and inquiring habits—and make no doubt he is possessed of many secrets in bell-ringing worth knowing; but we should be dealing with an undeserved want of candour by him, were we to give him the least hope of this appeal being taken up in the way he evidently expects. If the world is to wait for the true theory of bell-founding till the "philosophical societies of different nations" send a deputation, with well-lined pockets, to Barton-upon-Humber, to treat with Mr. Harrison for its disclosure, we are afraid it will have to wait a long while; there are few philosophical societies who have pence to spare; and were the case otherwise, there are many objects of scientific inquiry on which money might be expended to more advantage than bell-ringing. Besides, what assurance, save Mr Harrison's own, could the learned have, that he is really in possession of the "new science" which he offers to "add to the sciences of Europe?" And in what would he differ, in this respect, from the herd of ordinary pretenders? Mr. H. has given us, indeed, this "Introduction" to his intended treatise, and by way of specimen, we presume; but we must frankly tell him we see nothing in it, that should induce the scientific world to make that extraordinary effort to obtain the sequel which he seems fondly to anticipate. He had much better adopt at once the usual course—reveal first, and look for fame and profit afterwards. It is the course which numbers of individuals, not inferior to Mr. Harrison in ingenuity, and who have toiled quite as long in equally important pursuits, have been content to follow; and it is one of which men of real merit have not in these days often cause to complain.

We subjoin a letter which we have received from a correspondent, pointing out an error into which Mr. Harrison appears to have fallen with respect to the new form of bell introduced by Mr. Drury. It will be also seen from this letter, that Mr. H. is not the only person who claims to know all about the pro-

portions of bells; another reason for his printing forthwith:—

Sir,—I have just been reading "An Introduction to a Treatise on the Proportions of the constituent parts of Bells, and on the relative proportions of Bells of different degrees of acuteness and gravity to each other," by "James Harrison, bell-founder, Barton-upon-Humber." I cannot say that I have been able to make out distinctly what the author would be at; except that he wishes the public to subscribe a good round sum to induce him to disclose a something about the proportions of bells, which, his word for it, will be worth all the money. My present business, however, is not with Mr. Harrison's discoveries, which it will be time enough to discuss when we know what they are, but to offer a remark or two on the way in which he speaks of the improved bells lately introduced by the very ingenious Mr. Drury. He says, "the vibrations of these bells depend upon the most simple principles—their sides being quite straight, and the shape very similar to a round tub." "*Of course* the vibrations of these bells are only supported by *one* impelling cause, that of the circular form." But how does this agree with what Mr. H. elsewhere tells us of church bells?" "We have seen," he says, "that the vibrations of church bills are actuated by *three* impelling causes,—the crown, the curvature, and the circular form." Now Drury's bells has at least *two* of these,—the crown, and the circular form. What becomes then of Mr. H.'s assumption, that they have only one impelling cause? Or of the argument he founds on that assumption, that they will not answer? He says they are like a tub: I suppose Mr. H.'s tubs have no bottoms, otherwise the similitude would have reminded him of the blunder into which he has fallen. The fact, as I have occasion to know, is, that Mr. Drury's experiments have been continued with quite as great "pertinacity," and for even a greater length of time than Mr. Harrison's. Neither do they differ so much in the result of their investigations as might at first sight be supposed. They have each discovered the advantage of reducing the height of bells; but in this, Drury goes to a greater extent than Harrison; and while Mr. H. has been trying all manner of fanciful curves, Mr. D. has proved beyond the possibility of doubt, that they are equally good if not better without any curve at all; he has also given more importance to the crown, than Mr. H. does. So far has he gone with his experiments and calculations, that he has formed tables to the extent of eight octaves, with all the semi-tones; by which he does, and any other bell-founder who possessed a copy of these tables, might, cast bells in tune true to the fifth part of a note.

I am, Sir,
Your obedient servant,
V. W.

Clerkenwell, Feb. 13, 1839.

REMARKS ON THE VARIOUS MODES OF HEATING.

Sir,—In your last vol. p. 389, you give Minutes of a Conversation which lately took place at the Institution of Civil Engineers, on the Comparative Advantages of Heating by Hot Water, Hot Air, and Steam. Had not the doctrines there promulgated been given to the world under the auspices of such high authority, I might never have troubled you with the following observations, but emanating as it were from the very fountain-head, I think, for the sake of the profession, they ought not to pass unnoticed.

Mr. Turrell gives his opinion in favour of hot water, because, he says, the circulation will continue as long as there is any heat in the boiler; whereas, on the contrary, there can be no flow of heat through steam pipes any longer than the steam is kept up in the boiler.

Mr. Simpson declares that warming by water, possesses a decided superiority over any other method from the comparative security afforded against accidents by *fire*, for he has known instances of its being introduced into banker's houses, who had previously objected to *steam* pipes!!

Mr. Cottam thinks it very desirable that some experiments should be tried to ascertain the relative expense of heating by the different methods, as from all the observations made in the course of his practice he can only quote one instance, the saving in which appeared to be about one-third; but, from his regard to truth, he is obliged to confess, that the construction of the hot air flues was extremely faulty, he is, therefore, of opinion, that this statement of the saving ought not to be considered as decisive.

Mr. Sibley appears somewhat surprised that no inconvenience is felt from the operation of the simple apparatus he has had fitted up at his house, although it produces the following wonderful effects

from a boiler that forms the back of the kitchen range; by means of a two-inch gas-pipe it warms several rooms, boils a cistern!! and heats a bath on the top of his house, a height of fifty feet.

Mr. Turrell observed, that to counteract the ill effects of a hot air stove, he adopted a plan of charging the atmosphere of the room with moist vapour.

Mr. Field thought hot water pipes preferable, because the heat given out by them was always of a very moderate degree, while the temperature of steam pipes is always high, and also, when used in his office, they created a most unpleasant smell, accompanied by an oppressive feeling on the lungs.

Mr. Clegg being employed to correct the unpleasant smell created by the air coming in contact with the red-hot surface of an iron stove, he effected his purpose by covering the stove with a non-conductor of heat!

Mr. Hawkins was of opinion, that the oppressive feeling spoken of, arose not from any decomposition having taken place, but from a deficiency of moisture.

Having now extracted the sum and substance of the opinions of the above-named professional gentlemen, delivered avowedly for mutual improvement, and published for the edification of the uninitiated; you will please to observe, Sir, that I do not intend to deny *in toto* the superiority of the Sangrado system here developed, as I am of opinion that each method has advantages peculiar to itself, which circumstances alone must decide. I merely intend to point out the want of agreement among these gentlemen, with respect to the facts about which they conversed, and the total want of sound reasoning displayed in their multifarious and contradictory conclusions.

In the first place, Mr. Turrell's argument in favour of hot water, founded on the continuance of the circulation, can have but little weight, when it is considered that no beneficial effect can arise from it, unless its temperature is considerably above that of the surrounding medium.

The argument of Mr. Simpson is no better worth, as it amounts to little more than something like wishing to draw a comparison between the inflammability *of hot water, and* that of steam. Mr. T. *seems to think no one ought* to doubt of the combustibility of the latter, because he has known some careful old ladies, who have admitted hot water into their houses, after having objected to *steam* merely through their dread of *fire*.

The evidence of Mr. Cottam must be considered as perfectly neutral, as he still thinks it advisable to institute a set of experiments for the express purpose of ascertaining which is the best method.

Mr. Sibley's statement partakes somewhat of the marvellous, especially where he talks of boiling a cistern by means of hot water pipes; the contents of which (according to my notion of the system) can never rise to any thing near the temperature of boiling water. Moreover, by conducting his pipes to the height of fifty feet, he subjects his boiler to a pressure of about 22 lbs. per square inch, whereas a pressure of steam equal to two pounds on the inch, would be fully sufficient to effect all that he has so erroneously attributed to hot water. Query—Is this to be taken as an example of the extra security attainable by this method?

I shall pass over Mr. Turrell's secondary observations, which brings us to Mr. Field, whose lukewarm reason for giving the preference to hot-water pipes, at once contradicts the statement of Mr. Sibley, and at the same time is, I d ubt, but little calculated to create admirers of the system. With respect to the smell, &c. arising from the steam pipes in his office, I can only say, that where the pipes, as well as the joints, are sound, I never before heard, nor did I ever experience any thing offensive from cast-iron steam pipes.

Mr. Clegg's evidence requires no comment; and Mr. Hawkins coincides with Mr. Turrell, in the opinion, that a damp atmosphere is necessary for a healthful respiration. Surely, as Mr. Herbert says by patents, there must be a fashion in these things, as it is not many years since warming by steam was every thing that could be wished for—so congenial to health, so economical, and so tractable that any temperature might be obtained with the greatest uniformity, without impairing in the slighest degree the salubrity of the atmosphere.

I remain, Sir, yours, &c.

TREBOR VALENTINE

Derby, May 3, 1832.

CAUTION RESPECTING THE USE OF IRON ROOFING.

Sir,—I have lately seen a person from near Birmingham, who tells me that he has had considerable losses in his cow stock, both by deaths and illnesses, owing, as he afterwards found out, to his cowshed being covered with sheet iron. The iron, he says, attracted the sun, and the sheds not being plastered, the heat affected the stock. When the thought struck him, he put his boy up to touch the iron inside, and it *blistered* his finger. Another person had also been a considerable loser by his horses being affected from the same cause. I request you will publish this as a caution, and am,

Your obedient servant,
T. M.

STEAM-BOILER EXPLOSIONS—SAXULA'S SAFETY-PLATE.

Sir,—A very ingenious friend of mine requests me to obtain for him, from such correspondents of your Magazine as are well acquainted with the laws of projectiles, an answer to the following question:—"How much expansive force per square inch must be exerted on a horizontal circular plane of 1200 square inches area to project 2½ tons 30 feet high, and to fall 60 feet distance?"

The question arises out of the fatal explosion of a steam-boiler, which lately occurred in his neighbourhood. The boiler was a common round one about 2½ tons weight, the fracture took place in the central part of its bottom, following in general the course of the rivets; the hole was about 1200 square inches area; the boiler was lifted about 30 feet high, and fell at 60 feet distance from its seat. A woman passing at the time was killed, and the engine man is not expected to live.

I must not omit reminding your readers of my surety-plate of sheet lead, mentioned at p. 221, vol. xiii. It is much different, and very superior in its action to a leaden plug, as that can only yield at a melting temperature, before arriving at which many a boiler would burst, whilst the plate of lead will not only have the property of the plug, but will also indicate any less degree of strength at pleasure, and give previous notice of danger by expansion. It is yet to be shown that a boiler could possibly explode with my plate upon it.

I send herewith two plates that have opened and liberated the steam when overcharged, one from a colliery-engine, and another from the boiler of a steam-carriage, built to prove the *economy and efficiency of long levers* being used with short ones. In the last, the glass water-gauge burst at the same moment, which makes the fracture in the lead a small one.

Yours, &c. SAXULA.

April 18, 1832.

[The first of the surety-plates transmitted with the preceding letter, is a circular leaden plate of 7 inches in diameter. The pressure of the steam had caused it to bulge out in the centre at a regular distance of about 2 inches from the circumference till it burst, leaving a wide though ragged opening, amply sufficient to give vent to that excess of power which would have otherwise blown the boiler into pieces, and might have caused the loss of many lives. The plate in its present ruptured state has very much the appearance of a waggoner's hat with some half a dozen wide rents in the crown. The second of the plates is $1\frac{5}{10}$ inch diameter. The bulging has taken place exactly in the same manner as in the case of the other plate; though for the reason stated by our friend, Saxula, the rupture is proportionably much less —about $\frac{1}{10}$ inch in length, and not $\frac{1}{10}$ inch in breadth. Both plates are left at our office, and may be seen by any person desirous of farther satisfaction on the subject. To us it appears that they furnish unanswerable evidence of the efficiency of this mode of preventing explosions. A plate thus ruptured may be replaced with little trouble, and at almost no expense; and, as Saxula suggests, even the rupture may be avoided by attending to the progressive expansion that must necessarily precede it. An alarm-bell might be made so dependant on this bulging of the plate, as to make a surprise from explosion next to impossible. —ED. M. M.]

Proposed Improvement near St. James's Park.—Mr. Rigby Wason, M. P., has drawn what appears to be a very excellent plan for the improvement of Tothill-street, and the neighbourhood on the western side of

St James's Park. He proposes to clear away the ugly barracks in Birdcage-walk, to take down the whole of the space behind which includes Tothill-street and York-street, to form a new street leading from Westminster Abbey to Upper Grosvenor-place, and make two new squares opening into the Park. One benefit of the practical adoption of the plan would be, that it would clear away all the dirty houses in the low neighbourhood of Tothill-street and York-street. The new streets which would be formed, would materially promote the circulation of a better atmosphere, and the general health of that district.—*Examiner.*

Single Line Railways.—In the number of your Magazine for this day (No. 454) is a proposal by Loco for single line railways—which is, I think, liable to the following objection:—If any delay should take place in the starting or travelling of any of the trains, and in spite of every possible precaution, such delays would occasionally occur, a collision would take place from the extreme velocity of travelling, which would impede the railway and cause delay in the other trains. I am, Sir, &c., F. SMITH, April 21, 1832.

Locomotion.—" Sir, S. Y., the *soi disant* young engineer, will be ashamed when he grows older, of what he has written at page 30; he appears not to know the meaning of one of the two words " virtually," and " fulcrum." The one, I apprehend, signifies possessing the virtue, without the appearance; really, not seemingly: the other signifies a prop or support (generally a fixed prop). Now, how can an " imaginary centre" be a real prop? He cannot solve my problem at page 441, vol. 16, and so he reviles it. By his style, and gracious assurances of future notice, he might be the great Cham of Science, or President of the Infallible Society. 'Tis time we both said 'adieu,' when reviling takes place of argument.—SAXULA."

Cunning of the Hand.—Dr. Jones, in noticing an American patent, for punching sickles and cutting files by machinery, observes, " The best machinists of England and France have failed in such attempts, and that from the inherent difficulty of the subject. The force of the blow requires to be varied not only on different pieces of steel, but also on different parts of the same piece, in consequence of the difference in its texture. The hand of the skilful workman soon becomes habituated to this difference, and adapts itself to these variations; but a machine never can be made to do this, however intellectual its inventor may be."

Preservation of Timber.—It is a singular fact that in the Cornish Copper Mines, the pump-rods, which are principally of Norway balk, as well as the braces and other timbers, are apt to become sound, and covered with fungus at the place where they are subjected to the action of the land-water above the adit to which the mine-water is pumped, while the parts only exposed to the mine-water remain perfectly sound and clean. Under the impression that mine-water possessed the power of destroying the sap or vegetating principle of timber, and thus be found a preservative against the dry rot, a quantity of timber intended for ship-building was sent from Plymouth some years ago and steeped in copper-mine water; but the result of this experiment is not yet known.

Cuvier.—The Paris papers announce the death of this celebrated philosopher. He had reached the last stage of a general paralysis, but preserved his mental faculties entire. He had even calculated on the reality of his situation, as he expressed continual regret at being obliged to leave so many works unfinished, amongst others his " Comparative Anatomy," which he had laboured for some time to recast. In the course of the last month he had prepared upwards of a volume and a half, comprising osteology; and it was during the progress of this work that he was seized with his fatal illness. M. Cuvier was the son of a Protestant minister, and *born at Montbéliard, in 1769,* that fertile year that gave birth to Napoleon, Chateaubriand, Schiller, Sir Walter Scott, Canning, &c.

Black Colours.—The blackness of bodies is supposed by philosophers to be owing to the luminous rays that fall upon them being in great part absorbed or stifled in their pores; and hence they also receive heat more freely than others. Black marble or tiles, exposed to the sun, become sensibly hotter than white ones. Black paper is kindled by a burning-glass much sooner than white, and the difference is strongly marked; a burning-glass, too weak to have any visible effect at all upon white paper, shall readily kindle the same paper rubbed over with ink. Hence black clothes, when wetted, are said to dry faster; black habits, and rooms hung with black, to be warmer; black mould to be a hotter soil for vegetables; and garden-walls, painted black, to answer better for ripening of wall-fruit than those of lighter colours. It is not, however, to be affirmed, that the like differences obtain in the impressions made by common fire. Black paper held to the fire does not seem to be affected sooner, or in a greater degree, than such as is white. It may be proper to observe also, that the combustibility of the paper may be increased, by impregnating it with substances of themselves not combustible, and which give no colour to it. This is the foundation of one of the sympathetic inks as they are called, made of a strong solution of sal-ammoniac in water; which, though colourless when written with on paper, becomes very legible on exposing the paper to the fire—that is, it occasions the parts moistened with it to scorch or burn before the rest of the paper is hurt, to a brown or black.

How to Tin Nails, Tacks, &c.—First clean the surface of the articles to be tinned from rust or other oxide, by pickling them, or putting them into sulphuric, muriatic, or nitric acid, diluted with water, as usual, and washing them well afterwards in water; then put them into a stone-ware gallon bottle, together with a proportionate quantity of bar or grain tin, and of sal-ammoniac: next place this vessel, lying upon its side, over a charcoal fire, made upon a forge-hearth, and keep turning it round, and frequently shaking it, to distribute the tin uniformly over the surfaces of the articles to be tinned; lastly, throw the articles into water, to wash away all remains of the sal-ammoniac, and finally dry them in saw-dust made warm. The great merit of this process consists in the employment of the stone-ware vessel, which not only prevents the dissipation of the sal-ammoniac in fumes, but also gives up the whole of the tin to the articles to be tinned, which would not be the case were a metallic vessel to be used.

INTERIM NOTICES.

The communication alluded to by Mr. Bayley never came to hand. We have endeavoured in our present Number to supply the information sought after by his " Inquiry," and shall be glad to receive the papers which he contemplates writing on the same subject. To his business inquiry—Yes, very soon.

We shall always be happy to hear from Mr. Gooch. Both of his last communications are intended for insertion.

Communications received from A.—Mr. Edwards—Vapeur—C. G. P.

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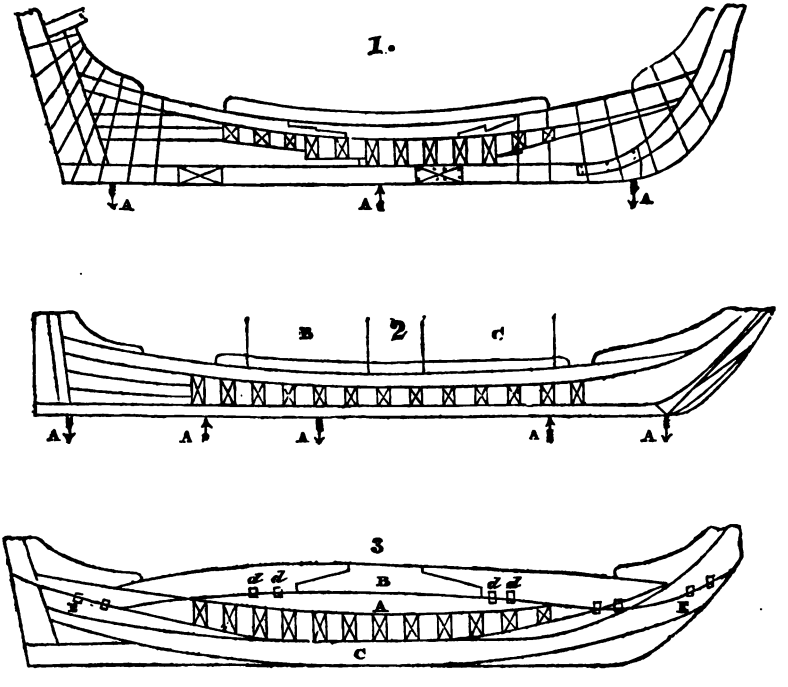
"The honours to which men occasionally arrive add but little to the dignity of real worth; to promote, on a principle of duty, the instruction and improvement of one's fellow-creatures, constitutes the best nobility." HARNESS.

BAYLEY'S PLAN OF CONSTRUCTING STEAM-VESSELS.



PLAN OF CONSTRUCTING STEAM VESSELS, BY WHICH THE ADDITIONAL STRENGTH REQUIRED MAY BE OBTAINED WITH THE LEAST POSSIBLE ADDITION TO THE WEIGHT. BY MR. GEORGE BAYLEY, SHIPBUILDER, IPSWICH.

(*For introductory letter, see last No., p.* 102.)

Fig. 1 is a section of a sailing vessel. The arrows AAA show the direction of the pressure. It will be observed that the fore and aft parts of the vessel are much stronger in proportion than the midship part, which has notwithstanding (on account of its greater buoyancy) to sustain the greater part of the weight of the vessel and cargo.

Fig. 2 is the section of a steam-boat, in which the direction of the pressure is shown, as in Fig. 1, by the arrows AAAAAA. B is the situation of the furnace boiler; C that of the engine. It is evident that the framing of that part of the vessel which has to sustain the greatest pressure is so constructed that its strength or stiffness is only equal to that of the materials used—having no abutment to sustain any part of the pressure.

If the keel and kelson were framed together in something like the sketch, fig. 3, the parts which have to sustain the greatest pressure would be materially strengthened. A is the piece or pieces now usually applied on the top of the main keelson by way of rider, which is to be fayed down to the floors, but on no account to be scored into them. The top or back of the piece A should be moulded so as to form an arc of a circle of large radius, provided that would not raise the keelson too high amid-ships; but if this should be inconsistent with the purpose for which the vessel is designed, then its upper surface should be perfectly straight. B is the main keelson fayed upon the top of the rider with which it is connected by the coaks *d d d d*, which should be according to the size of the vessel. C the main keel, which should be moulded to an arc whose versed sine is sufficient to allow the ends to meet the ends of the keelson B, to which it would be connected by bolts and coaks at E E. The whole should then be bolted together in the usual way, with a plate under the head of each bolt, and its point well clenched upon a plate. The lower part of the keel is made good at each end by slice pieces. The stem may be scarphed with a flat scarph to the keel, and strengthened by a stemson and apron in the usual way.

G. B.

ALLEGED DECLINE OF SCIENCE IN ENGLAND.

The weeping philosophers who, some months ago, astonished themselves and the world by the stir they contrived to create, respecting what they asserted to be the decline of science in this country, may now fairly be considered as beaten out of the field. Yet they have taken something by their motion: Mr. Babbage has received that encouragement, in the shape of the cross of the Guelphic order, which the 12,000*l.*, voted him by Parliament, on account of his wonderful calculating-machine that is to be, had failed to give. His worthy second, Doctor Brewster, member of all the scientific societies on the face of the globe—and moreover, editor of the Edinburgh Journal, and concoctor of Treatises on Optics, "which are level to the capacities of ordinary minds," is entitled to dub himself a knight, in the very receipt, for the snug little pension granted him, before the encouragement of science was dreamt of; and their superworthy compeer, Sir Nicholas Nicolas, may (in fact he does) put his new title, and his new office (in the Herald's College), at the head of his furious diatribes, charging the powers that be with total neglect of himself and his transcendant merits! Yet, notwithstanding they have effected all this, "all this and more," the declinarians have sustained a terrible discomfiture. Their monstrous assertions have been contradicted and disproved on all hands. Foreign science has generously rushed in to the rescue, and triumphantly challenged the truth of their most alarming fulminations. The pamphlet of Professor Mohl, however, served chiefly to expose the utter fallacy of their ideas, as to the superior state of science, and the superior dignity and fortune of scientific professors, abroad. A later writer, a countryman, whose pamphlet* is now before us, has

* An introductory lecture, delivered in King's College, London. By J. F. Daniell, F.R.S., professor of chemistry in King's College. London, 1831. B. Fellowes. 8vo. pp. 32.

completed their defeat—put them out of court altogether, by simply and quietly taking their modern instances, one by one—bringing them to the test of examination,—and, to the utter confusion and disgrace of their authors, showing, that the facts, adduced in proof of the alleged decline, are *altogether false and unfounded*—that they could only have been brought forward through the ignorance of their assertors, as to what was passing around them in their own peculiar sphere. Nothing can be conceived more satisfactory than this exposure, a good part of which we shall proceed to quote at once, although it will occupy some space. It cannot be too widely circulated:—

"One whose authority, upon all matters which he can afford the time duly to investigate, is most valuable, has asked, in a tone of despondency, 'Who can tell us any thing of the sulpho-salts? Who will explain to us the laws of isomorphism? Nay, who among us has even verified Thenard's experiments on the oxygenated acids? Oersted's and Berzelius's on the radicals of the earths? Balard's and Serrullas's on the combinations of brome? and a hundred other splendid trains of research in that fascinating science, chemistry?' Now, these questions, which have never possibly been answered, for the simple reason that the answers to them are so easy and obvious that no one has hitherto thought it worth while to make of them a formal display or a boast—have been brought forward as 'specific and incontrovertible proofs' of the fact of the decline of chemical science in this country. These doubts, which probably presented themselves to the mind of the inquirer in a mood too exquisitely sensitive to the painful and slow degrees by which all acquirements in science are effected, and nervously impatient of the obstacles which the imperfection of our nature opposes to every species of intellectual advancement—have been laid hold of as an excuse for a severity of criticism which it would be difficult to justify, upon institutions and men, who, whatever of human imperfection may have attached to them, have done good service to the cause of science. They imply, however, a want of acquaintance with the common routine even of our principal schools of chemistry; which if excusable in one whose days and nights are possibly dedicated to the all-absorbing pursuits of the highest branches of science, is utterly *without palliation* in those *who adopt them, without investigation*, as the basis of vituperation not only severe but personal. * * *

"We are asked, 'Who among us has ever verified Balard's and Serrullas's experiments upon brome?' Most simple is the reply. In the courses of lectures given in the Royal Institution, and in the London University, of which I can speak from personal knowledge, bromine and its compounds are as regularly introduced and illustrated by experiments, as chlorine or iodine. It ought also to have been known to those who so unsparingly censure the ignorance of others, that the Professor of Chemistry in the University of Oxford has not only verified the experiments referred to, but has extended the discovery of the new elementary substance to the brine springs and other mineral waters of this country.*

"The question is also asked, 'Who among us has ever verified Oersted's and Berzelius's experiments on the radicals of the earths?' And can it really have been supposed, for a moment, that the professors and directors of that laboratory from which emanated the first glorious train of research which ended in the decomposition of the alkalies and earths, have become so inactive and inefficient as not to have the desire or the ability to verify experiments, which are the mere lodes and veins of that mine which was opened under their own inspection? Has Davy, indeed, left no mantle behind him—no disciples worthy of their master? Well may we lament for these degenerate days!—if we do not rather grieve—that such things should be assumed without due inquiry, for the purposes of detraction. I can, however, vouch for it, that at the Royal Institution these objectors might have witnessed the production of magnesium, aluminum, and silicon, with much less trouble than it cost them to transcribe these questions; and to the merest tyro of both the schools which I have named I refer them for the manner in which the processes are explained.

"Again it is inquired, 'Who has ever verified Thenard's experiments upon the oxygenated acids?

* * * * *

The discovery of the deutoxyde of hydrogen, the legitimate result of M. Thenard's experiments, has been verified in the Royal Institution; and if the new compound be not ordinarily exhibited in lectures, as a class experiment, the expense, and not the difficulty, of the preparation prevents its illustration.

"'Who will explain to us the laws of

* Memoir on the Occurrence of Iodine and Bromine in certain Mineral Waters of South Britain. By Charles Daubeny, M.D. &c.

isomorphism?' proceeds the objector. If by this a doubt is meant to be expressed, whether the phenomena of isomorphism, as developed by their discoverer, Professor Milscherlich, are duly known and appreciated in this country, I again appeal to the classes of our schools: but if we are accused of ignorance of the general laws which connect these facts together, it is an ignorance which we share with the natural philosophers of other countries; and greatly do I doubt whether much more of observation must not precede any useful attempt to theorise upon this interesting subject. That England, moreover, is not at the present moment destitute of men who are competent to reason, if not precipitately, closely and powerfully upon this subject, has lately been evinced in a paper which adorns a late number of one of our scientific journals."—Page 7.

Our quotation has already extended to such a length, that we must restrain ourselves from giving the refutation of the charge, as to the sulpho-salts, which is necessarily more lengthy than the rest, but to the full as convincing. What the poor declinarians can possibly find to say, in answer to this terrible exposure of their ignorance and presumption (proverbially united), it is not very easy to conjecture. That they, at the very moment of preferring charges of ignorance against others, should themselves be so totally ignorant of what was passing in the world of science, immediately around them, is indeed enough to provoke the exclamation, "Oh! shame, where is thy blush!" There is one amongst them, whose accession to the ranks of the croakers we have always deeply deplored—and to him Mr. Daniell alludes, when noticing a silly charge which Mohl, and all who have written on the subject, have very naturally been surprised to see brought forward.

"In collecting together the 'scattered' evidence of the fall of chemistry, the accuser has found one more specific charge from a different quarter. Some of our most eminent chemists, it appears, have successfully directed their attention to other branches of natural philosophy, and have pre-eminently advanced the science of electro-magnetism; they are, therefore, arraigned for a misdirection of their talents; and are held responsible for not having decomposed nitrogen, and insulated the suspected fluorine. To this it is indeed difficult to return a serious answer. What if we were to mete by the same narrow measure! What might we not say to the profound mathematician who quits the calculus for chemistry, not to perform the labour of a successful cultivator of *the* field, but to undertake the inglorious task of depreciating the exertions of others? But I refrain."—Page 16.

That the master-mind, to which we owe the admirable "Discourse on the Study of Natural Philosophy," should be capable of a descent to "detraction"—and that, too, a detraction from the merits of his fellow-labourers in the field of British science, is indeed a humiliating reflection. As to the rest of the phalanx, their censures, after the fate of their present crusade, no one will, for the future, think worth the trouble of refutation. They recently had the hardihood to advance, in a number of their gazette (Brewster's Journal), that no *English* scientific character (this was cunningly put in to exclude Mohl) had attempted to controvert their arguments. We took occasion, when reviewing M. Mohl's pamphlet, to explain, that though none of our men of science had publicly repelled these attacks in their own names, there had not been wanting replies, which, though anonymous, were known to proceed from persons no ways inferior, in scientific eminence, to the proudest of the declinarians. Professor Daniell has now, however, given them something more tangible to contend with than any anonyme, however respectable. They have got an answer now with a vengeance—and much may it profit them!

Professor Daniell's sentiments, on a subject which has been much mooted, and not without effect, in some quarters, by Sir David Brewster, Sir Charles Babbage, and a whole knightly host of learned doctors, are worthy of the character of a genuine man of science.

"The first object of my ambition will be,—the object of the founders of the college,—the steady advance of my pupils in sound and useful knowledge; and, should my exertions for this end be rewarded with success, I shall not care, though I may be doomed to share, with the professors of our English Universities, the reproach of a Scottish philosopher; that they are disadvantageously distinguished from "philosophers actively and constantly engaged in original research," because their names are not found in the lists of medallists and correspondents of foreign academies, in which his own so conspicuously appears.

I confess, gentlemen, that I am not of the number of those, who so loudly lament that science, in this country, has no peerages—no orders of merit, no ribbons, red or blue—to offer to her votaries. How low, indeed, must be his estimate of her attractions, who can think that she need hold out such lures to worship at her shrine? Strong is the conviction in my mind, that such temptations never yet led a generous spirit one forward step in his inquiry after truth, or in unravelling the sequence of natural causes and effects. No man, indeed, *ought* to be insensible to the approbation of the wise and good; but if you deserve it, doubt not that it will find you out without a badge to your persons."—Page 29.

ON THE NATURE OF COMETS.

Sir,—I had thrown together a few remarks upon the extraordinary theory of comets, put forth by J. F., at page 75; some of them have, however, been superseded by the communication of Mr. John Edward Wall, in your last number; I have, therefore, selected the following, as an addition to the well-grounded arguments of that gentleman:—

In the first place, J. F. assumes that comets are opaque solid bodies, like the sun, moon, earth, and other planets; a position still disputed by many eminent philosophers, and not yet satisfactorily proved by any. Secondly, J. F. asserts, that no fire, however large, can be seen at any distance during the presence of the sun's rays, a fact not so easily established as J. F. imagines. We read, in ancient chronicles, of "great blazing starres," which frightened our forefathers at noon-day; and we know that the flames rising from volcanoes during eruptions are visible at considerable distances, even in the day-time; we are, therefore, not warranted in the conclusion, that a body of fire, upwards of one hundred and sixty millions of miles in diameter,* would not be visible even in the presence of the sun's rays.

But suppose we admit (for the sake of argument), comets to be opaque bodies, undergoing the purifying influence of fire (apparently a very lengthened process), and that the fire only becomes visible to us by the interception of the sun's rays by the comet, giving us the resemblance of a tail; still the theory is at variance with the usual appearances.

The sun being the larger of the two bodies, the shadow, thrown behind the comet, must be a cone, of which the diameter of the comet constitutes the base; we should, therefore, see the tail in the form of a tapering light, growing smaller and smaller until it was finally lost in space, its length depending upon its distance from the sun. Unfortunately for J. F., however, the tail of the comet so far from being confined within the limits of the conical shadow, and bounded by well-defined straight lines, actually diverges, and assumes a brush-like appearance; with other modifications, completely at variance with the hypothesis of your Cranbrook correspondent. Indeed, the spreading of the tail appears quite to have escaped his notice; for he says, "when the comet is situated in a line with the earth and the sun, its tail must of course be rendered invisible to us." Observation has shown, that when the sun and comet are so situated, the train or tail is all hid behind the body of the comet, except the extremities, which, being broader than the body of the comet, appear to surround it like a border of hair—and it is on that account termed hairy.

Again, according to J. F., the tails of comets should decrease in lustre and magnitude as they approached the sun; while, it is observed, that the tail increases, both in length and brightness, as it approaches the sun, being at its greatest brilliancy just after the comet has passed its perihelion—after which it gradually decreases. Mr. Wall appears to be in error upon this point.

With respect to the recorded appearances of some of the comets, I would wish particularly to call the attention of your readers to that of 1811, the tail of which was stated to be thirty or forty millions of miles in length, but of an extremely attenuated nature, as the stars were seen distinctly through it. The tail of this comet presented a very remarkable appearance, being composed of two diverging streams of light, slightly coloured, which made an angle of from fifteen to twenty degrees, and sometimes more. These branches were curved in opposite directions, each being bent a

* The tails of some comets have been stated to be eighty millions of miles in length, which, according to J. F.'s theory, *gives the dimensions as above stated.*

little outward, and descended from the nucleus like a veil; between the branches, and surrounding the nucleus, was a space comparatively obscure.

But the most striking phenomenon of this kind was that presented by the comet of 1744, the tail of which was distinctly divided into six branches or rays, all diverging, but curved in the same direction—between these rays the stars were visible. The appearance of this comet is beautifully depicted and described in the Encyclopædia Britannica, art. Astronomy.

Although our information on the subject of comets is not sufficiently extensive to enable us accurately to define either the nature of their composition, or the laws which govern their motions, still it is sufficient to guard us against the adoption of any theory so palpably erroneous as that of J. F.; who, upon the single fact, of the tail being always turned away from the sun, has founded a theory at variance with almost every other fact recorded of these bodies; affording a striking illustration of that often quoted line of Pope's, "*A little learning*, &c."

I am, Sir, yours, &c.

W. BADDELEY.

May 19, 1832.

LONG AND SHORT CRANKS.

Dear Sir,—I expected that some of your common-sense correspondents would have, before this time, put an end to the locomotive arguments that have so long filled your valuable pages; it has become almost as tedious as the Gilman controversy was, and it is time that we had something new. In the hope of settling the question, I venture to trouble you with the following remarks:—

Your correspondent Hezron, in No. 455. says (though not exactly in these words), that when a locomotive moves, the fulcrum is on the plane or road; but that when an obstacle prevents the locomotive from moving forwards, it is transferred to the axle. Now, I maintain that the axle is always the fulcrum; for suppose, instead of the machine moving forward, it moved the rail-road, as in a rolling mill, it is quite evident that, where the power to turn the rollers is applied, is one *end of the lever—that* the axle is the *fulcrum—and that where* the periphery of the roller touches the iron rolled, is the resistance; and this, whether the iron be drawn through, or from some cause or other, the roller or rather rollers turn round, without causing the iron to move forward. It is precisely the same with a locomotive machine, whether it moves forward, or meets some object to prevent it from doing so. There can, therefore, be no advantage in using a long crank; in fact, the length of the crank must be determined by circumstances; for if it be required to drive a locomotive at ten miles an hour, an engineer, after having determined on the power of his engines, and the size of the wheels, would make the crank of such a length as would cause the pistons to travel at the best corresponding speed—a matter with which all manufacturers of steam engines are, or ought to be, acquainted.

I am, Sir, yours, &c.

VAPEUR.

PRACTICE OF STEAM DRYING MALT, WHEAT, &c.

Sir,—The practice of drying malt, wheat, and other grains, respecting which Zeta makes inquiry in your last volume, p. 63, is by no means uncommon. It has been followed with great advantage by several extensive maltsters, farmers, hop factors, &c. &c. The apparatus consists of a common steam boiler, with as much surface of pipe as may be requisite for the size of the building intended to be used as a drying-room. The pipes are placed horizontally, about one foot from the floor, as in the following sketch:—

a a are two steam pipes; *b* front inclosure of frame-work, covered with fine fly-wire, or perforated zinc, to prevent the grain from accumulating round the pipes; *c* is the floor line. There must, of course, be sufficient ventilation provided for at the top of the building, as also a free passage for the external air to enter. It will be a saving to have the room lined with plain tiles, glazed.

For the further satisfaction of Zeta, and others interested in this matter of steam drying, I shall here make an extract on the subject, from the excellent work of the late Mr. Tredgold, on "Warming and Ventilating Public Buildings," 1824:—

"But there is a new and more important application to be considered; for in all districts where fuel is cheap, steam may be used with perfect safety to dry corn, in case of a wet harvest. An apparatus for this purpose would not be expensive, and would soon repay for the construction; a boiler and steam-pipes would form the chief part of the things wanted, in addition to what is usually to be found in any farm-yard. Hurdles would serve to spread the sheaves upon, and these might be laid horizontally upon cross bars, or poles, at about 18 or 20 inches apart. Tarpaulins or winnowing sheets would serve to enclose the space through which the heated air should ascend and circulate among the sheaves; and afterwards go out at the roof of the barn, or other building where the drying is conducted. A malt kiln with a steam apparatus, would make an excellent place for drying corn in a wet season; and I have no doubt, that in many districts the use of artificial heat will increase, and the loss of much valuable grain be prevented.

"Besides, with the knowledge that he can raise his corn in good condition in a bad season, the farmer will have a mind more at ease; he becomes secure of that, which, in the ordinary course, is very frequently most seriously injured, and sometimes altogether lost. He may also turn the same contrivances to advantage in a wet hay-harvest; and temporary erections will soon be changed for permanent ones. The certainty of artificial heat will be to the farmer as important as the certainty of power is to the sailor; and those two classes of men, who have hitherto depended more than others on seasons, will both receive great benefit by the application of steam. It is not farmers alone that will be benefited by drying corn artificially in backward and wet seasons, for in such cases the whole population must feel the good effect of this plan. Unsound grain makes very indifferent bread, doctor it as you like, and the evil is too frequently a very general one."

I would recommend, however, to Zeta, a hot water apparatus in preference to a steam one, as it would require less fuel, and consequently less attendance—retains the heat longer, without attention, and is of much simpler construction.

I am, Sir, yours, &c. D. D. NEEVE.

6, Wyndham-street,
Dec. 6, 1831.

LIEUT. DRUMMOND'S PRINCIPLE OF REPRESENTATION.

Sir,

Your correspondent who signs himself T., has lately given us a number of very dry articles on what he calls the "Principles of Commercial Science." The gentleman seems to have a very elevated opinion of his arithmetical attainments; but I am afraid very few but himself read his articles. In No. 458, he endeavours, without using either rhyme or reason, to overturn Lieutenant Drummond's principle of representation; as demonstrated by your scientific correspondent, Mr. George Scott. So far as the mere matter of calculation is concerned, I believe the gentleman is right. But with regard to principles, he has proved that he has much yet to learn before he can pretend to overturn a mathematical demonstration by a multitude of figures only. T. takes good care not to grapple with Mr. Drummond's system. He appears to be a disciple of the great Mr. J. W. Croker, one of his Majesty's Commissioners of the Board of Longitude. The calculation he has given seems at least to be founded on the Croker system. Now, with regard to that scientific commissioner, (I know him well) he, perhaps, could manage to solve a numeral simple equation involving one unknown quantity, provided there were no fractions in it. Or, perhaps, T. (like Mr. Croker) in trying the effect of other values of i beside $\frac{s}{S}$ discovered from Mr. George Scott's theorem, that when $i = 1$, $D\left(\frac{a + A\,i}{s + S\,i}\right)$ becomes $D\left(\frac{a + A}{s + S}\right) =$ $658\left(\frac{57,152,990}{76,757,444}\right) = 490$, the number England should return. This is T.'s solution. But, in the name of common sense, why should i be taken $= 1$, in preference to 2, 3, 4, &c.? Mr. Scott has assigned the best of all possible reasons for assuming $i = \frac{s}{S}$ or $\frac{52,764,444}{23,992,800}$

2·199 +; because it is the annual average importance of a man, whether he be English, Scotch, or Irish. From which it evidently follows, that any number taken for i, less than 2·199, would be doing injustice to Ireland, and if greater than 2·199, it would be benefiting Ireland at the expense of England and Scotland. It must be known to most of the readers of the Mechanics' Magazine, that some of the very first mathematicians in England and Scotland have examined and fully approved of the soundness of Mr. Drummond's principles.* The only one who has any pretension to science who has opposed it is Mr. Pollock, M. P., who was some years ago a First Wrangler at Cambridge. His system is as follows:—

Using Mr. Scott's notation, let $(A\,a)^{\frac{1}{2}}$, $(B\,b)^{\frac{1}{2}}$, $(C\,c)^{\frac{1}{2}} = m, n$, and P; assume $m + n + P = R$; then $R : m :: D : \frac{D\,m}{R}$ = number England should return, and $\frac{D\,n}{R}$ and $\frac{D\,P}{R}$ will be the numbers for Scotland and Ireland; which, arithmetically expressed, will be 477, 67¼, and 113¼, respectively. But the absurdity of Mr. Pollock's system has been shown by at least twenty able writers in the London and other journals.

I am, Sir,
Your obedient servant,
PHILO SCOTT.

Bedford-street, May 20, 1832.

ABSOLUTE VACUUM.

Sir,—I beg leave to submit to the curious, the following sketch of an instrument for procuring a vacuum, liable, however, to the objection, that no substance can be introduced into it for experiment.

I am, Sir,
Yours, respectfully,
O.

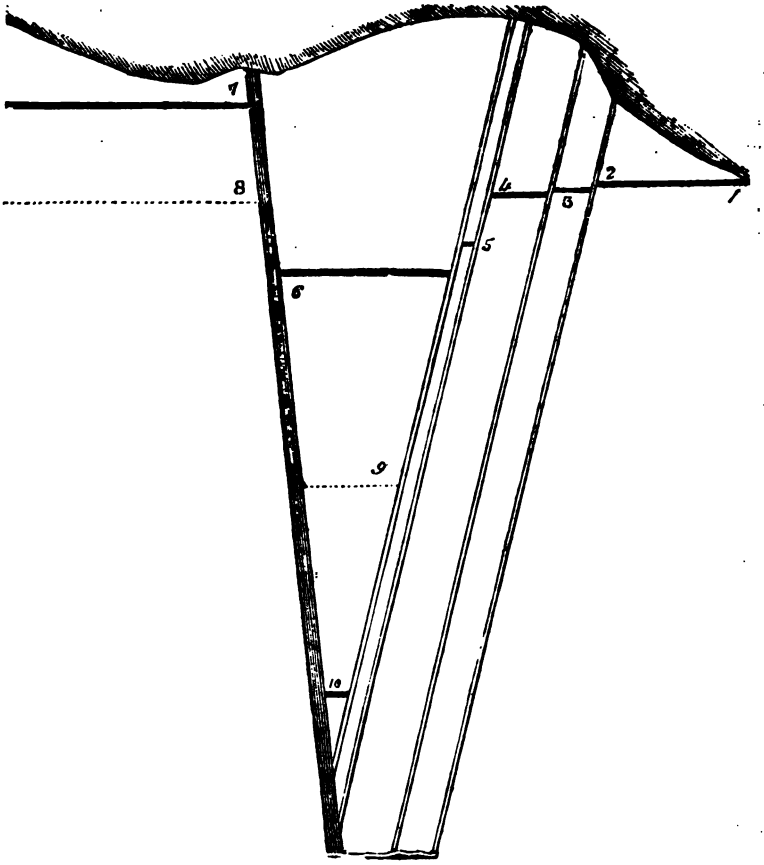
Sunderland, April 3, 1832.

Explanation of the Engravings.

Fig. 1 represents a cylinder A open at both ends. To correspond with one end is a perfectly flat plate of metal B. The lower surface of the piston C is also perfectly flat, and when placed on the plate B, there exists nothing between them. The cylinder then being let down to the plate, draw up the piston as in fig. 2, and the space D is a void.

* *It has been approved, we have occasion to know, by Sir William Herschell, Professor Airy, Professor Wallace, and Mr. Barlow.*—Ed. M. M.

ON THE LOCALITIES OF INFLAMMABLE GAS IN COAL MINES.



Sir,—"Humanitas," in explaining Mr. Ryan's plan of ventilating coal mines, has also endeavoured to show, that only the deep angles or the deepest sides of faults that drop the veins of coal down are subject to inflammable gas.

I have had daily practice for the last thirty-six years in a mine which furnishes a case in point, directly in opposition to this theory. The prefixed sketch shows the direction of the coal vein with the different faults. The figures 1, 2, 3, 4, 5, 6, and 7, all denote one vein of coal; 1 is the crop out of the coals to the east—2 is a five-feet downfall—3 a six-feet downfall—4 an eleven-yards downfall—and 5, an eleven-yards downfall, all to the west; from 6 to 7 is a seventy-yards upthrow to the west. The coal from the crop 1 to 2, from 2 to 3, from 3 to 4, from 4 to 5, and from 5 to 6, has been working the whole of the thirty-six years, and had been worked several years before, and is still worked, but it has not during all this long period been troubled with inflammable gas. On commencing, however, to work the coal on the top of the seventy yards upthrow at 7, we had to encounter gas in abundance. Another vein of coal opened through the fault at 8, contains no gas. I think these facts must serve to convince "Humanitas" that inflammable gas is not always confined to the lower strata. Faults, or dislocations invariably [illegible]

upthrow it leans from us at top; if a downthrow, it leans over us at top. In consequence of this, when faults are situated with respect to each other as represented in the prefixed sketch, they must form an angle with each other in the earth below, which, in this instance, will be in the old red sandstone 10, over which there is a limestone strata 9.

Faults or dykes may be more useful than we are aware of. They invariably go all through the upper strata to the earth's surface; and down also diagonally till they meet each other in the way represented; the smaller ones ending in one great fault or trunk of which they seem so many branches. It may be, that they are absolutely necessary to the successful working of coal to any considerable depth in the earth; however, I merely throw out this as a speculative suggestion for the consideration of some of your more scientific correspondents.

"Humanitas" states, that the expense of working coal is increased in proportion as collieries are troubled with inflammable gas. But this has not been the case with the colliery here; for the coal at 6 costs 25 per cent. per ton more than it does at 7.

The air bags and gas-heads "Humanitas" speaks of, are useless things in *long work;* for the regular current of air along the open face of the coal will sweep away all impurities, and keep a mine as sweet as any house above ground.

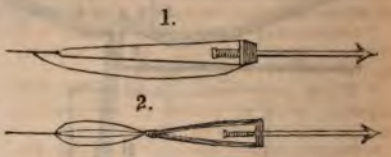
When we crossed the seventy yards' upthrow at 7, and encountered the gas, I supposed that we had come upon a large gas blower for the whole of the eastern part of the colliery; but, finding upon crossing it lower down at 8 into another vein of coal, that there was no gas there, I saw the error of my first conclusion.

It is remarkable that the seventy-yards' fault discharges alone more gas at 7, than the whole open space of coal at work in that part of the colliery which is producing a large quantity of coal daily. The first drift made through the seventy-yards' fault, was from east to west at 7, and was full of gas. The next drift was also from east to west at 8, and quite free from gas.

I am, Sir,
Your obedient servant,
THOMAS DEAKIN.

Blaenavon Iron-Works, April 9, 1832.

IMPROVEMENTS IN MR. MURRAY'S PLAN FOR INSTANTANEOUS COMMUNICATION WITH STRANDED VESSELS.



In No. 441, we gave an account of Mr. Murray's excellent invention for saving from shipwreck, abstracted from a pamphlet published by that ingenious and very philanthropic gentleman. We have now before us a "Supplement" to that pamphlet, in which Mr. Murray describes some material improvements which he has since effected. In the experiments which we last recorded, Mr. Murray had only got the length of being able to project his safety-line from a common musket; but the purpose of the present "Supplement" is to announce that "in a thousand instances *a pistol* with an arrow and its line will afford sufficient means to convey a rope and establish a medium of escape from the wreck to the shore."

The improvements made consist in a better construction of the arrows, and will be readily understood from a comparison of the prefixed sketches with that given in No. 441. The arrows, 1 and 2 are made of solid iron, and the spindle is polished to allow the sliding appendage and the recoil-spring to fly backwards with as little resistance as possible. The arrow is of metal, because it is found to project much farther than one of wood. The recoil-spring is of steel, which answers better than the cork or caoutchouc originally proposed. The snapcord is intended to meet the first sudden jerk, and provide a double curb to the violent impetus of the projected line, so that a charge of gunpowder double or treble what is usual may be employed. The arrow, No. 1, weighs, together with its appendages, 4¾ ounces, is 1 foot long, and ⅞ inch in circumference. The arrow, No. 2, weighs, with its adjustments, 5¾ ounces, is 10½ inches long, and 1 inch in circumference.

With the arrow, No. 1, Mr. Murray made the following experiments, making use of a pistol 8½ inches long, and 1½

inch diameter in the bore, and a cord 110 yards long, weighing 11 ounces:—

"First experiment; at an angle of 40 degrees, with 23 grains of gunpowder, the arrow carried the line 71 yards.

"Second experiment; at an angle of 30 degrees, with 34 grains of gunpowder, the line was carried 72 yards.

"Third experiment; at an angle of 45 degrees, with 46 grains of gunpowder, the line was carried 85 yards.

"Fourth experiment; at the same angle, and with a similar charge, the line was carried 83 yards.

"Fifth experiment; at same angle, and with a similar charge, the line was carried 84 yards.

"In no instance did the cord break."

With the arrow No. 2, the following results were obtained; but it does not clearly appear, from Mr. M.'s statement, whether with a musket or a pistol:—

"At an angle of 45 degrees, with 46 grains of gunpowder, and the wadding hard rammed down, the arrow carried with it 110 yards of line.

"The cord and all the adjustments, as in the other experiments, remained completely entire, and were not, in the most remote degree, injured. The recoil, in the last case, however, was rather too violent, from the additional weight of the arrow, and the degree to which the wadding had been rammed down; a circumstance which it seems necessary to state.

"The gun, which has been manufactured by Mr. Pritchard, of Birmingham, under my directions, can discharge eight drachms of gunpowder with great ease.

"The arrow, in this case, was formed of brass, with a sliding ring embracing the rod, and having the line attached to a loop, the whole weighing 6¼ ounces, carried a platted hemp cord, double the thickness of a garden line, more than sufficient to pull a considerable rope on board, from the shore, and adequate to form the requisite line of communication with the vessel. This arrow carried the line 57 yards, with only one drachm of gunpowder.

"In the second experiment, the arrow carried the line 112 yards, with 2½ drachms of gunpowder. These last experiments were made at Birmingham, and in no instance whatever did the line break.

Mr. Murray adds the following valuable practical remarks:—

"I. *The arrow.*—The material of the arrow should be iron, and the more tough the better; perhaps old horse shoes, welded longitudinally *and in separate* pieces, will be the best, and finally wrought in the manner of the English twisted gun barrels, or the French "*canons à ruban*"—or ribbon barrels, which approach sufficiently near to them.

"II. *Gunpowder.*—This differs materially in power and propelling force. It has, I believe, been estimated as high in some cases as equivalent to a thousand atmospheres. Colonel Mark Wilks informed me, as the result of a series of experiments made by him at St. Helena, that semi-burnt charcoal very materially increased the power of gunpowder. Willow, hazel, and dogwood, are the woods which supply charcoal for powder mills; and the last, if I am correctly informed, is preferred at Battle for the manufacture of the finest kinds. The smaller grained is inflamed more rapidly than the other, and it should seem, from experiments made in reference to the question, that the inflammation is also more complete. A little lycopodium powder mixed with the priming, while it would facilitate the ignition, would tend very materially to protect it from wet, and therefore render it much more certain.

III. *Wadding.*—This may be formed of a slice of thin cork, or of an old hat or card punched out, or of soft brown paper, which last will seldom fall to the ground nearer than a distance of 20 or 30 feet from the muzzle of the piece. Some attention must be paid to this circumstance, since, if formed of too pliant materials, such as cotton, &c., it will not be of sufficient consistency for the purpose; it will, therefore, lose in force, and the shot will not be carried so far. On the other hand, if the wadding be too stiff and inflexible, or rammed down too firmly, the shot will spread, and the piece will recoil considerably more. A medium in both, therefore, will be found essential.

"IV. *Recoil.*—This arises from the retrograde motion of the piece, and is dependant on a well known law in mechanics, namely, that action and re-action are alike. Excess in the recoil may be generally traced to inequality in the bore, but it is taken for granted that the piece has been submitted to the usual proof before it leaves the hands of the manufacturer. The weight of the piece being the same, the recoil will be in the ratio of the quantity of gunpowder and the weight of the ball, or other projectile. The recoil will also increase with the number of times the piece is fired, which would seem to connect the question with the evolution of moisture or expansion by produced temperature; it is also, as has been stated, attendant on the wadding being rammed down too firmly. The butt end

of the gun must be held closely and firmly to the shoulder.

"V. *Bursting of the Barrel.*—This is a very rare event, and easily prevented. Sometimes, indeed, it is the fault of the workman, and proceeds from a defect in welding, but the reputation of a respectable manufacturer being compromised, very little danger need be apprehended. The only other causes likely to occur in this question is the danger of an overcharge, which a correct measure accompanying the powder flask or canister will most effectually prevent—the gun manufactured by Mr. Pritchard, will bear 8 drachms of gunpowder, and not more than 3½ drachms can ever be required, leaving a reversion of 4½ drachms of powder. There therefore remains only another caution, and that is, the end of the arrow must be brought in complete contact with the wadding, which will be effectually secured by the angular elevation of 45 degrees—an elevation which secures the greatest range; the general cause of bursting in ordinary cases is to be attributed to the circumstance of the ball not being rammed home, and a space left between it and the charge of gunpowder.

"So simple an apparatus might be disposed of in a small compass, and when put up in a convenient case, kept on board vessels; it might thus be made available in a few seconds, in the hour of danger. The impulsion of the arrow would be materially assisted by the gale blowing towards a lee shore, and it would have, in relation to the line of direction and its successful receipt on shore, the combined advantages of an extensive segment of a circle over a merely central point."

Not the least important feature of Mr. Murray's plan is its great cheapness, compared with every other which has been proposed:—"The expense required for the establishment of a few stations of Captain Manby's apparatus will supply some thousands of these (blunderbusses, muskets, or pistols)—in fact, suffice for the British isles." Mr. M. states, that a "gun with six arrows, two lines each 200 yards long, two tin cans to hold the lines, a powder-measure, a supply of wadding, &c., will cost (only) from 4*l.* to 5*l.*;" and "the smallest gun (query, the pistol?) with the apparatus complete, much less."

We are glad to perceive that the "National Institution for Saving from Shipwreck" have determined on forthwith introducing Mr. Murray's invention *on the dangerous coast of* Sussex; nor can we anticipate less than its speedy adoption along all our shores. Mr. M. adverts with great modesty to the trouble and expense which he has been at to bring the invention to its present state of perfection, but rather by way of apology for not doing more in its behalf, than with a view to eliciting any public reward. We trust, however, that a great and generous nation will not on that account be the less disposed to mark, in some suitable manner, its sense of the valuable present he has made to it. If Captain Manby was thought well deserving of 3,250*l.* for his imperfect apparatus, it cannot be that the inventor of one in every respect superior to it should be suffered to go wholly unrewarded.*

APPLICATION OF PROJECTILES TO RESCUING FROM FIRE.

We extract from the "Supplement" alluded to in the preceding article, the following proposition for the application of Mr. Murray's pistol and arrow to the purposes of a fire-escape:—

"I have already particularly referred to the application of the arrow and line to the instantaneous formation of a fire escape in cases of fire, and it has been mentioned that the cord projected over a building was found quite sufficient to draw a rope over the roof. The suggestion was to make it thus effective for an extended rope ladder, which might be instantaneously formed on both sides of the building. The parallel ropes employed in the formation of the rope ladder must needs be kept separate by bars of wood alternating with rope, in order to prevent approach; and a single rope would suffice, there being steps attached to the side like the stirrup, the footstep having its base formed of wood, which would thus preserve an open space; the rope might be either projected at once over the roof and fastened on the opposite side, or the arrow be fired into one of the highest windows, or wherever required; to the top of the rope attached to the line might be fastened a lantern, to direct proceedings; a hammer and staple with a

* In our notice of Mr. Murray's first pamphlet we quoted from it a statement, to the effect, that in the storm of December, 1830, 28 vessels went on shore between Plymouth and the Land's End, out of the passengers and crews of which only two men and a boy were saved. A writer in the United Service Journal, for April last, has shown that Mr. Murray has been misinformed. He gives the names of 9 vessels, "the entire crews of which were saved."

tally, instructing the inmates to drive the staple firmly into the floor, for fastening the rope of escape to it. For the purpose of facilitating the descent of the timid or helpless, the rope referred to might be supplied with two or more blocks, with pullies on each side, through which patent sash cord might pass for the purpose of raising or lowering a square basket, for the reception of invalids or females and children; and by the steps provided, some intrepid and enterprising individual might ascend for facilitating the rescue of the infirm and timid.

"There are cases wherein no fire escape hitherto proposed would have proved effective in saving the hapless inmates. I may mention, as an instance of this description, the conflagration of Mr. Haigh's cotton-mills, at Colne-Bridge, near Huddersfield, some years ago, and in which seventeen individuals perished, as recorded in the pyramidal tomb reared over their ashes in the neighbouring church-yard."

A mode of rescue similar to this of Mr. Murray's—only that a cross-bow is used instead of the pistol and arrow—has been already successfully reduced to practice by the admirable fire-establishment of Edinburgh. As the Edinburgh arrangements for the purpose are more complete than those of Mr. M., and are most of them equally adapted to the present invention, we shall here add the account given of them by Mr. Braidwood, in his excellent work on fire-engines (Edin. 1830.)

"The apparatus necessary for this fire-escape is a chain-ladder, 80 feet long, a single chain or rope of the same length as the ladder, a canvass-bag, a strong cross steel bow, and a fine cord of the very best workmanship and materials 130 feet long, with a lead-bullet of 3 ounce weight attached to one end, and carefully wound upon a wooden cone, 7 inches high, and 7 inches broad at the base, turned with a spiral groove, to prevent the cord slipping when wound upon it; also a small pulley with a claw attached to it, and a cord reeved through it of sufficient strength to bear the weight of the ladder. In order to prevent the sides of the ladder from collapsing, the steps are made of copper or iron tube, fastened by a piece of cord passed through the iron tube and into the links of the chain, till the tube is filled. The steps thus fastened are tied to the chain with No. 14 copper wire, so that in the event of the cord being destroyed, the steps will be retained in their places by the wire. The ladder is provided with two large hooks at one end for the purpose of fixing it to a roof, window, sole, &c. The bag is of No. 3 canvass, 3 feet wide and 4 feet deep, with cords sewed round the bottom, and meeting at the top where they are turned over an iron thimble at each side of the mouth of the bag. The steel cross-bow is of the ordinary description, of sufficient strength to throw the lead-bullet, with the cord attached, 120 feet high. When the house from which the persons in danger are to be extricated is so situated that the firemen can get to the roof by passing along the tops of the adjoining houses, they will carry up the chain-ladder with them, and drop it over the window where the inmates shew themselves, fastening the hooks at the same time securely in the roof. The firemen will descend by the ladder into the window, and putting the persons to be removed into the bag, lower them down into the street by the single chain. If the flames are issuing from the windows below, the bag when filled is easily drawn aside into the window of the adjoining house by means of a guy or guide-rope. If the house on fire stand by itself, or if access cannot be had to the roof by means of the adjoining houses, the lead-bullet with the cord attached is thrown over the house by means of the cross-bow; to this cord a stronger one is attached, and drawn over the house by means of the former; a single chain is then attached and drawn over in like manner; and to this last is attached the chain-ladder, which on being raised to the roof, the firemen ascend and proceed as before directed."

PROGRESS OF STEAM TRAVELLING.

Sir,—The directors of the Liverpool and Manchester Railway are, according to Mr. Gordon, thinking of abandoning locomotive engines, and erecting stationary ones, or (oh, tell it not in Gath!) substituting horses; not, however, from any want of power in the engines, but because of the expense of keeping them in repair. Surely, however, this is a difficulty which ought not to be regarded as insurmountable. If government would offer something handsome, say 20,000*l.*, for a locomotive engine, weighing, with its appendages, not more than six tons, which should do a certain quantity of work daily for six or twelve months, and not cost, for repairs, more than a certain sum per hour per mile, I have no doubt

that would produce a perfect locomotive engine. Experience has shown, that locomotive engines of light weight are, under all circumstances, the most advantageous. Witness Mr. Crawshay's experiments—also, a few small engines erected, in this neighbourhood, on Mr. Stephenson's plan, improved by local engineers, which work well. Better roads can be kept, under light engines, at far less expense than in any other way. There is one defect that must be removed in locomotives: it is the quick motion of the pistons where speed is necessary. On the Liverpool and Manchester road the engines make 140 strokes per minute. Such quick motion must cause great wear to valves, and nearly every other part of the machinery. Reduce the strokes of the engine from 140 to 40 strokes a minute, and the wear of the engine would be reduced in that proportion. Where speed is absolutely necessary, I would connect the rods from the pistons, not to the wheels that carry the engine, but to large driving-wheels, working into small tooth-wheels, made firm on the outside of the wheels that carry the engine. I am aware of two or three difficulties that will attend such a mode of working;—one is, (it may be thought) that the engine would be more noisy; another, the back chuck of the tooth-wheels; a third, the addition to the weight of the engine; but I have little doubt they might all be got over.

I am, Sir, yours, &c.

T. D.

Blaenavon, 7th May, 1832.

SOCIETY FOR THE DIFFUSION OF USEFUL KNOWLEDGE.

"A Charter of Incorporation has, on the petition of William Tooke, Esq. been granted by the King to this Society, and the objects of it are thereby stated to be the '*causing* to be composed, compiled, and written, treatises, and works, and elementary tracts, on or relating to arts, sciences, and letters; and also *causing* to be made, engraved, and constructed, prints, maps, plans, models, and instruments, connected with arts, sciences, and letters; such treatises, works, tracts, prints, maps, plans, models, and instruments, to be printed, made, and published in an economical manner, and to be sold *at a reasonable price*.' The London General Committee is by such charter recognised as the governing body of the Society, and of which Committee the Lord Chancellor is constituted the first Chairman; Lord John Russell the first Vice-Chairman; and Mr. Tooke is named as Treasurer of the Society."—*Times*.

It would have been only fair in the promoters of this charter to have first promoted the repeal of the Statute of Monopolies; for disguise the matter as they may, this is an incorporation for trading purposes, of a greater number of persons than the law, as it stands, authorises. The Society may not publish for their own profit, but if they *cause* things to be published in their name, for the profit of persons of their own nomination, the effect is the same—the principle of the law is equally violated. Four weeks have now elapsed since the Society were publicly charged, in one of our most respectable literary journals, (the Athenæum) with permitting a certain Magazine to be published by one of their known agents, as *the* Magazine "*of* the Society for the Diffusion of Useful Knowledge," although the thing is a mere private speculation, in which the Society have not "any—the remotest interest." And an impression is very generally entertained, that this is only one of many similar instances, of the Society's name being used for personal and private objects. We have never seen any answer to this charge, and do not believe any has been made; but who will say, that it is such a charge as should have been passed over in silence, if it could possibly be contradicted? We have no liking to the statute of monopolies; but, while it exists, we would have all the King's lieges treated alike under it. The "Diffusion of Knowledge" is an object which every good man and true patriot must have at heart; but it will not, in the long run, be promoted by making a preserve of it for the pecuniary benefit of Mr. A. B., Mr. C. D., or any body else.

MOTION OF FLUIDS—DENSITY AND GRAVITY OF METALS, &c.

Sir,—Trebor Valentine, page 60, vol. 17, adverts to my remarks upon his experiments "upon the motion of fluids, &c.," as being incorrect; but I now again beg leave to say, that, on the

above subjects generally, I consider my remarks quite correct. In the first place, I have tried again several times the experiment mentioned by T. V., page 108, volume 16, and have not observed any nucleus or eddy in the water, during its passing out of the vessel. Neither is the surface in the least disturbed, which is easily proved by floating a cork on the water. In the next place, buoyancy is the only similarity melted metals possess with water, and that is peculiarly characterized. T. V. says, the only similarity he claims, "is, fluidity when fluid;" which, I think, we may grant. But I cannot grant, that melted metal can in any way be called a fluid, any more than terming water, generally, melted ice; nor has it any of the "mechanical" properties of fluids, excepting, as I before said, buoyancy.—Again, allow me to ask, how can the "power of gravity" account for cold iron floating on the surface of melted iron, or even on melted lead, when T. V. acknowledges the solid to be specifically the heaviest? Surely, it must be the strong affinity that melted particles, of the same metal, possess for each other, that can alone account for it. I must further persist in thinking, that "the expansion of congelated water is owing to the air it contains, upon which also its buoyancy depends in some measure." If the principle of affinity, and presence of air, were not combined in water to give buoyancy, vessels of every description would necessarily sink. The sea, holding a large proportion of muriate of soda in solution, is rendered more dense, and consequently more buoyant. I certainly never heard of the "buoyancy of frozen water;" but it can be proved, that congelated water expands from the air it contains, simply because air cannot freeze, and consequently is "disengaged by cold;" and must, therefore, form the globules we observe in ice. When the air escapes from the congelating water, it must expand, from receiving a portion, more or less, of the disengaged caloric; and when it happens that the whole of the exterior becomes first solid, the air must seek escape internally, and will then generally produce an explosion. Water, in a continual state of agitation, receives constantly an accession of fresh air, which keeps it pure and sweet; while still water becomes foul, from the want of a supply of fresh air.

I am, Sir, yours, &c.

G. L. S.

Enfield.

BRAITHWAITE'S STEAM FIRE-ENGINE.

We witnessed a very gratifying display of the powers of this engine (described in Mech. Mag. No. 340), at the great fire at Messrs. Barclay and Company's brewery, on Tuesday last. The fire broke out about five o'clock in the afternoon, but, unfortunately, more than three hours were suffered to elapse before the steam fire-engine was sent for, and as it had then to come from a distance of four miles, it was near ten o'clock before it was brought into play. When we reached the scene of the conflagration, which was shortly after eleven o'clock, we found the engine in full operation, under the direction of Messrs. Sidney and Septimus Braithwaite, and Mr. Milner, jun. From that time till five o'clock in the morning we saw it in constant work; ejecting between thirty and forty tons of water an hour, and to heights, as occasion required, not much short of 100 feet. Mr. John Braithwaite joined the forces of the "Steam King" in the course of the night, and greatly distinguished himself by the spirit and intrepidity with which he personally directed the stream of water on the most dangerous parts of the burning pile. We saw also some of the ordinary engines very well worked, the Guardian in particular; but by the time the steam fire-engine came into the field, the firemen of all the others had been greatly exhausted by several hours' hard working during the worst period of the conflagration. One of the strongest recommendations of the steam fire-engine is, that when once set to work it *never tires*. We were informed by one of the partners in the brewery that the Norwich Company's engine had in the early part of the evening distinguished itself beyond all the other engines by the vigour with which it attacked some of the loftiest parts of the premises. The manner in which the fire originated, may furnish a useful lesson to all persons who have occasion to introduce lights into apartments where there are ignitible particles floating about. A

workman was proceeding with an open lamp in his hand to grease a part of the machinery called Jacob's-ladder, when the dry malt-dust, with which the atmosphere of the place was impregnated, caught fire, and spread so rapidly and irresistibly, that within an hour the whole of the working part of the brewery was in flames. The damage is estimated at about £50,000.

Hydraulic Cyder-Presses.—Sir, Events over which we mortals have no control have prevented me, or long ere this I should have returned you, and your correspondents, my best thanks for your kindness in noticing my inquiry of October last. Mr. Russel's (or, as it appears, Mr. Bramah's) press is the best adapted for the purpose of all that have been submitted in your Magazine. Your Bristol friend has the next place; but there is a thing, which all have forgotten, which is a very material one with us farmers, What will it cost? for on that depends every thing. The press I should like to have would be the open one of your correspondent, T. B. G., with the power acting under, as in Bramah's. I think it would be worth the expense and trouble, if Mr. Russel had lithographic drawings of such a one, and would send them to all the towns in the south of Devon, as Exeter, Totness, Kingsbridge, Plymouth, &c., for seeing is believing with your Devonshire dumpling. Wishing you, Mr. Editor, and your Magazine, every success, I remain yours, &c., A SUBSCRIBER FROM THE FIRST, Staverton (not Stiverton), May 19, 1832.—P. S. Mr. Russel may be very well known in London, but we in the country would be much obliged if he would say where he may be found. [Mr. Russel's address is St. John-street, Smithfield.—ED. M. M.]

Rising in Life.—A striking proof of the advantages which the community derives from the seasonable extension of the hand of benevolence to the purposes of education, was given at the Yorkshire Society Meeting on Saturday last, by a beneficed clergyman, distinguished in the University of Cambridge for his classical and mathematical acquirements, and well known for many literary works of great utility and merit. The gentleman alluded to, in addressing the meeting, frankly and manfully avowed that he had been himself originally a lame and poor boy, and was indebted to gratuitous instruction for that education which had raised him to his present station in society, and qualified him to sit at the same board with some of the first noblemen in the land. The sight of the children who had that day been presented to the meeting was one of the most delightful spectacles with which his eyes had ever been gratified; and the recollection that he, like them, had been a poor Yorkshire boy, and must have been left to all the darkness of habitual ignorance, except for the benevolence of others, inspired him with the most ardent zeal to encourage and support the best interests of the Institution.

Machinery in Australia.—The Sidney papers state that the proprietor of the Cowan Saw Mill, the first that has been erected in New South Wales, has now brought his machinery to such perfection that he can cut 450 feet superficial of flooring-boards, or 600 feet of battens, in one hour; the teeth of the saws pass through the space of 8,200 feet per minute, being at the rate of 96 miles an hour, a speed never known before to be produced by *animal power*. The fly-wheel of this machine travels at the rate of 7000 feet per minute.

Gigantic Observatory.—In the neighbourhood (of *Delhi) there is a gigantic astronomical observatory, supposed to be a work of the Hindoo Rajah Jey, Sing, in the 17th century. There is a dial in very* good repair, the gnomon of which is sixty feet high of solid stone masonry. These enormous instruments appear as though they had been manufactured by the Titans, in order to take a reconnoissance of the heavens before they commenced their siege of Olympus.—*Mundy's Sketches of India.*

LIST OF NEW PATENTS GRANTED FROM THE 20TH OF APRIL TO THE 20TH OF MAY, 1832.

Robert Montgomery, of Johnstone, Renfrew, for his construction of a machine for a new mode of spinning cotton, silk, flax, and other fibrous substances; communicated to him by a certain foreigner. Two months; April 26, 1832.

Lieutenant-Colonel Sir Charles Webb Dance, of Hertsbourne Manor-place, Hertfordshire, for certain improvements in steam-boilers. Six months; April 28, 1832.

John Holt, the younger, of Whitby, rope-maker, for the application of a mode or process for preparing and manufacturing certain fibrous substances. Two months; April 28, 1832.

Charles Axon, of Heaton Norris, Lancashire, cotton-manufacturer, for a certain improvement in the machines called throstles and doubling frames, made from cotton, silk, linen, woollen, and other fibrous substances. Two Months. May 1, 1832.

George Goodlet, Leith, proprietor of the London, Leith, and Edinburgh steam-mills, for a new method of preparing rough meal from ground wheat or other grain previous to their being dressed for flour; also rough meal from ground barley, malt, or other grain, previous to their being put into the mash tun for brewing or distilling. Six months; May 3, 1832.

Robert James Hendrie, of Blossom-street, Shoreditch, Middlesex, dyer, for an economical mode of improving dyed silks. Six months; May 3, 1832.

John Heathcoat, of Tiverton, in the county of Devon, Esq., for certain new or improved methods of draining and cultivating land, and new or improved machinery and apparatus applicable thereto, which machinery and apparatus may be applied to divers other useful purposes. Eighteen months; May 15, 1832.

Charles Augustin Busby, of Brighthelmstone, Sussex, architect and engineer, for an improved method of producing the circulation of fluids, through pipes, cisterns, or other vessels, applicable to the warming or cooling the interior of buildings, and to other purposes. Two months; May 15, 1832.

INTERIM NOTICES.

The article "How to Tin Nails," inserted in our last Number, from the miscellaneous contributions of a correspondent, should have been acknowledged as taken from the Technical Repository of the ingenious Mr. Gill.

Communications received from Pericles — Mr. Erichsen — B. M. E. — Lacidar — Mr. Emmet — T. T. C. C. — Caballais — Mr. E. Batley — Mr. Frampton.

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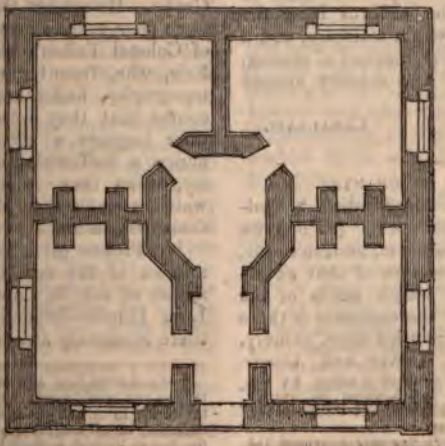
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 460.] SATURDAY, JUNE 2, 1832. [Price 3*d*.

DESIGN FOR A MILESTONE COTTAGE.



DESIGN FOR A MILESTONE COTTAGE.

For the Mechanics' Magazine.)

It having been proposed to erect cottages on the sides of roads, instead of placing milestones, to mark the distances; and, as the idea seems to have been received with pleasure, it is not perhaps too early, already to design a building solely for the purpose.

It will be seen, by the prefixed design, that I propose to render the milestone cottage additionally interesting and useful to the traveller by a clock and a wind-indicator. It would also add greatly to the utility of such buildings, if the inscriptions and the clock-faces were illuminated, so that they might be legible in the darkness of night. There is no occasion for me to descant on the advantages to be obtained by erections of this description, as that has been done by the proposer (T.); but it may not be amiss to suggest, that the mile-stone cottages, if built suitably, might serve sometimes, according to the situation, for turnpike or patrole stations, or even to be let as residences; for, although some would think it an objection to have their abode stared at by all, it would no doubt be a great advantage in the eyes of many.

This design would of course be subject to, and improved by various "alterations, additions, or omissions," according to circumstances. There is no staircase shown in the tower—a step ladder would perhaps be more convenient, as it leaves more room for the lobby. In some instances it might be well to have the tower higher, and with a staircase, and a lead flat and parapet, instead of slating, so that a view of the country around might be obtained.

CABALLAIS.

London, May 21, 1832.

BOOKS FOR EMIGRANTS.

In our notice of Mr. Mudie's "Emigrant's Pocket Companion," (p. 93) we hinted that the least novel, and, in so far, the least valuable section of that excellent work is that which treats of the countries to which the emigrant is there recommended to direct his steps, namely, the two Canadas, Lower and Upper. There has since appeared a work by Mr. Andrew Picken,* which is exclusively devoted to that description of information in which Mr. Mudie's book is deficient, and which supplies it so well, that we would recommend every intending emigrant to find a place for it also in his "deal chest." The author has made free use of the previous works of Talbot, Howison, Mactaggart, Bouchette, Macgregor, and Pickering;* but there is mixed up with what he has borrowed from these writers a great deal of new and valuable information, derived from unpublished official documents and from private sources. The title-page of the book acknowledges, in a special manner, the assistance which the author has derived from "original documents furnished by John Galt, Esq., late of the Canada Company, and now of the British American Land Association;" and no one who has read the "Todd Lawrie" or "Bogle Corbet," of that ingenious writer, will question the value of his co-operation in any matter connected with Canadian colonisation. Mr. Picken has also been much indebted to the private notes of a tour recently made through the Canadas by Nathaniel Gould, Esq., Deputy Governor of the British American Land Company; indeed, Mr. Gould's notes are among the best portions of the work, and leave the reader impressed with a strong desire for more of them. Of the importance to a stranger in Canada of the sort of information furnished by this work, there is a very striking illustration to be found in Pickering's Guide. He relates that he fell in with some poor emigrants who were in search of Colonel Talbot's settlement on Lake Erie, who, from ignorance of Canadian topography, had taken so roundabout a course that they were obliged to drag their luggage a good hundred miles across a half-settled and difficult country, when they might have gone by water-carriage to within eight miles of their destination.

Mr. Picken gives first a general delineation of the two Canadas, from the mouth of the St. Lawrence to the great Lake Huron—beyond which it appears there is scarcely any settlement in Upper

* The Canadas, as they at present commend themselves to the enterprise of Emigrants, Colonists, and Capitalists. By Andrew Picken. With a Map. London, 1832. Effingham Wilson.

* We observe that a fourth edition of this entertaining and useful work, with the author's additions to March, 1832, has just been published. It is well deserving of all the success which has attended it; for Joseph Pickering, though not himself a good example for emigrants to follow, being altogether a tourist, and no settler, is a shrewd observer, and a clever as well as faithful delineator.

Canada—and then a particular account of the several districts, counties, and townships into which these provinces are divided. We have next a descriptive account of the two great routes into the Canadas, the one by the St. Lawrence to Quebec, Three Rivers, Montreal, &c., the other by New York, Albany, &c.; with tables of the relative distances of places, coach and boat fares, expenses of living, &c. An interesting chapter follows on the "Climate of both Provinces," in which the preference for general salubrity is given to Lower Canada. Mr. Picken had proposed to wind up with a chapter of "General Considerations for Proposed Colonists," but before he had advanced many pages in this part of his task, there was issued from the Colonial Office a Report on the State of the North American Provinces by Mr. Richards, who was appointed a Commissioner for the purpose in 1830, and "as this document contains the latest information regarding the colonies," Mr. P. thought it advisable to lay aside his own pen and leave Mr. Richards to complete the volume. In this we think he exercised a very sound discretion. The 53 pages occupied by Mr. Richards' Report are by far the most readable in the volume. Mr. R. has contrived to be at once entertaining and instructive; and this is more than can be said of Mr. Picken, with all his abundant and exclusive sources of information.

Among the instances of successful settlement recorded in this volume, one of the most remarkable—perhaps *the most* remarkable ever heard of—is that of Mr. Philemon Wright, of whom Mr. Richards gives the following account:—

"Mr. P. Wright came from Wooburn, in Massachussets, in 1800, and took up lands upon the Ottawa; he brought capital and 25 labourers with him; since which he has cleared 3000 acres, owns four farms; employs 63 labourers, and 33 mechanics and assistants, and makes 1100 tons of hay annually; he has 755 acres in grain and roots, with stock and pasturage in proportion; his buildings are valued at 18,227*l.* and the sum total of his farms, stock, buildings, &c., at 57,068*l.* 15*s.* And such has been the result of a conversion from the wilderness in twenty-four years, when the land might be considered as without his value; but this situation has possessed advantages of a very peculiar kind."—P. 307.

In the Appendix there is a narrative by Mr. Wright himself of the whole course of his proceedings from first to last; and from this we should conclude, that his singular success has been owing not so much to the peculiar local advantages which Mr. Richards speaks of, as to a good head and a stout heart. Philemon Wright presents the perfect beau-ideal of human perseverance. He appears to have had many severe losses and crosses to contend with, but with a spirit which nothing could quail, rose superior to them all. How few men would not have sunk under such a calamity as he unaffectedly relates in the following passage!

"On the 8th of May, 1808, my mills were burnt, and not my mills only, but a large quantity of boards, planks, &c., which were preparing for the Quebec market. I had not a piece of board left for my use without either chopping it with an axe or obtaining it from a distance of 80 miles, except what was on my buildings. This loss was most severely felt, as it was very near destroying the settlement; *there was no insurance effected upon my mills.* This loss made me almost despair of ever recovering it, or doing any good upon the settlement, and I was about to quit it, but my sons wished me not to despair. It was also a great loss to the settlement, as the greater part of our corn was in the mill and burnt, with the exception of 7 bushels of flour, which was taken from the mill the night before; and to see the distress that was occasioned by this accident was most affecting."—Appendix, p. xxix.

Mr. Wright could not have been much less than ruined by this calamity, and yet sixteen years afterwards we find him, according to Mr. Richards, worth £57,068! Let no man after this despair, under any circumstances, of retrieving his fortunes; let him think of Philemon Wright, and try again.

Of the climate of the Canadas there are some peculiarities recorded which are deserving of more scientific consideration than they appear to have yet received:—

"A clear and light atmosphere, which has an exhilarating effect on the spirits—cloudless skies, and a dry air, fogs being in Canada almost entirely unknown—hard and steady frosts in winter, strong heat in summer, and a delicious mildness in the pleasing period of autumn—all make up a climate universally praised by those who have had long experience of it. What the cause is of that vivid lightness of the

air, and that beautiful clearness of sky both by day and night, which is so agreeable a peculiarity in the climate of this country, which yet presents so vast a surface of inland water, swamp, and forest, is not at all well known, no more than is the cause of its other distinguishing feature, namely, that the maximums of heat and of cold, respectively, are much greater here than in any of the European countries in the same latitude."—P. 270.

The years 1785 and 1814 were memorable for what are still popularly called the *Dark Days of Canada*. Among those notes of Mr. Gould of which we have before spoken, there is the following account of the singular phenomenon by which these days were distinguished:—

"A strange and alarming phenomenon has been seen in these regions, well known to many by the name of the *Dark Days of Canada*, which occurred in October, 1785, and in July, 1814. On these strange appearances there are several interesting notes communicated to the Literary and Historical Society of Quebec by the Honourable Chief Justice Sewell, the President, and printed in its Transactions, vol. ii. p. 230. These appearances consisted chiefly of a dismal darkness at noonday, so that as an eye-witness expressed himself, *jamais nuit ne fut plus obscur*. These periods of total darkness occurring in the middle of the day, continued about ten minutes each time, and were frequently repeated at twelve, two, three, four, and five o'clock; the intervals being partially relieved by vast masses of clouds, streaked with yellow, driving athwart the darkened sky, accompanied by sudden gusts of wind, with much lightning, thunder, and rain. Meantime the water that fell from the clouds was extremely black, and in the case of 1814 ashes and black powder fell from the atmosphere in partial showers on the shores of Kamouraska. In this latter case, though the time of the year was July, when the sun could be seen it appeared of a bright blood colour. These appearances have been supposed not to be chargeable upon the atmosphere, but to arise either from the conflagration of a forest or the eruption of some unknown volcano. The latter of these suppositions seems the most tenable, it being the report of the wandering Indians that a volcano exists somewhere in the unexplored wilds of the Labrador territory.—P. 277.

The "greatest desiderata in new settlements," as Mr. Richards justly remarks, "are mills and roads," including under the latter denomination internal *communications both by land* and water. Mills should of course be supplied by private enterprise, and, judging from the statistical details before us, we should say there are few places in either of the Canadas in which private enterprise has not kept pace with the demand for such establishments. Roads and canals belong to that class of improvements which it becomes Governments to see after; and it must, therefore, be on that account, that in the Canadas they have till within these few years received so little attention. The roads in the new settlements are still very generally left to be undertaken by the settlers themselves; and only two canals of magnitude have been commenced under the auspices of Government, of which one has but just been completed, and the other is still in progress. The Welland Canal, which forms a navigable communication between Lakes Erie and Ontario, (avoiding the falls of the Niagara), is 42 miles long, and 56 feet wide (at the surface), and has cost about £300,000. The Rideau, which will connect Kingstown on the St. Lawrence with Bytown on the Ottawa, will be 135 miles in length, and is expected to cost £500,000. These are great works, and worthy of a liberal Government; yet, after all, how insignificant in comparison with the canal recently completed by our Republican neighbours between the Hudson and Lake Erie. It is *three hundred and sixty-three miles* in length, and forty feet broad at the surface; was begun in 1817 and completed in 1825; and cost seven millions of dollars, the whole of which sum was contributed by the State of New York alone. It has 83 locks, and 18 aqueducts; and of the latter there is one across the Genessee river 804 feet in length, and another across the Mohawk of 748 feet. It has been said that all the works of nature in America are on a grand scale; but may we not after this include the works of art also?

On the progress of steam-navigation in British America we looked for more information in Mr. Picken's book than we have had the good fortune to meet with. The following is the only passage on the subject which we find worth extracting, and the information conveyed by it can scarcely be called new:—

"The steam-boats plying on this river are much larger than any usually seen in England, being six and seven hundred

tons burden, and so splendidly fitted up, that, like those on the St. Lawrence, sailing above Quebec, they are often named by travellers floating-palaces, and are spoken of as more fitted for voluptuaries than for cool, calculating Republicans. The captains have regular counting-houses in these splendid hotels; there are dressing-rooms, where a barber is kept in attendance, for the comfort of the passengers; liquors are kept of all sorts, and in general an abundance of pure ice; and the cooking is reported by Englishmen to be excellent. These vessels carry from 100 to 800 passengers daily, throughout the season, and some sail at the rate of more than twelve miles an hour. The fare by these fine vessels is remarkably moderate; and still more so by others that are more fitted for poorer travellers, as we shall have occasion hereafter particularly to state. These last conveyances are commercial vessels called tow-boats, which are dragged by relays of horses, and travel night and day."—P. 228.

Although tolerably well pleased with Mr. Picken's book upon the whole, we cannot take our leave of it without censuring the costly style in which it has been got up—a style altogether unsuited to the pockets of those for whose use it is designed. Had it been printed in the same unpretending manner as Pickering's Guide, or Mudie's Companion, that is, with double the quantity of matter in each page, it might have been sold nearly as cheap, and even then would have ranked in the scale of prices higher than it does in the scale of real merit.

ON THE NATURE OF COMETS.

Sir,—The remarks made in your last number by Mr. Baddeley on the nature of comets, rendering it absolutely necessary that farther explanation should be given concerning those bodies, I have attempted the following.

It has been imagined, by many celebrated astronomers, that comets are formed of electrical matter, and that they are useful in supplying the waste of the sun's rays, thrown upon the different planets. Light is electric, and electrics are non-conductors: the nucleus or body of a comet cannot therefore be solely electric; for, if it were, the fluid would disseminate through incalculable space, until it came within the attraction of any conducting substance. This *theory* (although *more plausible than that of J. F.*) is not so rational as the supposition of comets being composed of opaque matter like the earth, and receiving light from the sun, which they may partially return. If such a conclusion be drawn, it will appear less difficult to account for their brilliancy, and also for their tails, by the non-electrical, or attractive and conducting matter, of which globes are principally formed, added to their gravitative power, upon all that passes within the boundary of their influence. The shadow so clearly discernible behind the comet of 1811, plainly proved the opacity of that body, and as we have not any reason to doubt that comets turn upon their axis, like other heavenly bodies, it does not seem absurd to suppose, that the rays of light in each tail, may answer the purpose of a moon to the inhabitants of that part of the nucleus, which is turned from the sun.

With due deference and kindly feelings towards Mr. Baddeley, I think it would be advisable, previous to his quoting satire (as in the case of J. F.) to reflect, whether he may not have rendered himself liable to the lash of ridicule. Mr. B., in contradiction of the most eminent astronomers, declares, that the tails of comets increase in length as they approach the sun. The error into which this gentleman has fallen is so palpable, that I am astonished at its occurrence.* It is generally known, that when a comet arrives at its perihelion, or nearest point to the sun, its tail is not perceptible to us; and its length depending upon its increased distance from that luminary, clearly illustrates the cause of its being longest at its aphelion. If Mr. B. will look at any tolerable representation of the solar system, he will at once perceive his mistake, and discover also that the tails of comets are wider (though less brilliant) at their extremities, from the gradual expansion of their rays, until they nearly approach their aphelion, when the tails become narrower from their centre.

We are informed, that the fiery aspect of the comet of 1680 excited very great alarm: that the nucleus was surrounded by a blazing rim of light, and that the coma or tail of a flaming hue extended from the meridian to the horizon. This

* When a comet is at its perihelion, it is on the opposite side of the sun; the tail cannot therefore be visible to us.

comet was doubtless extraordinary; but we have sufficient reasons to believe, that the accounts transmitted to us concerning it have been grossly exaggerated. Sir Isaac Newton has calculated the return of this comet in 575 years; but we shall not live to ascertain its truth; and indeed the extensive orbits, and the inattention and inaccuracy of observers in former ages, has prevented us from recognising the return of any of those important bodies.

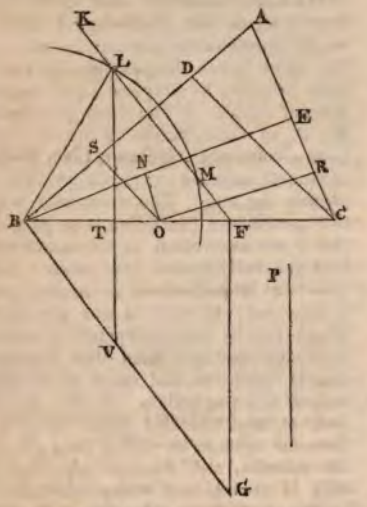
I am, Sir, yours, &c.

J. E. WALL.

84, Dean-street, Soho,
May 26th, 1832.

SOLUTION OF THE THIRD MATHEMATICAL QUESTION, VOL. XVI. P. 106.

By a Woolwich Cadet.



QUESTION.—To find, geometrically, a point in the base of a given triangle, so that if perpendiculars be drawn from it to the opposite sides, the sum of the squares of the perpendiculars may be equal to a given space, a maximum or minimum.

Let ABC be the given triangle, and the square of P the given space, to which the sum of the squares of the required perpendiculars is to be equal. Draw BE, CD, at right angles to AC and AB; *make BF = CD, and draw FG* perpendicular to BC and = BE; join BG. Through F draw FK parallel to BG, and from the centre B and distance = P describe the circle LM, cutting FK in L and M. Join LB, and draw LT perpendicular to BC, and produce it to meet BG in V. Make EN = LT, and draw NO perpendicular to BE, meeting BC in O. Then shall O be the point required. Draw OR·OS, perpendiculars to AC and AB. We have, therefore, to demonstrate that $OR^2 + OS^2 = P^2$.

By similar triangles BO : OS :: BC : CD ∴ BO·CD = OS·BC; also BF : FG :: BT : TV, BT·FG, or BT·BE = BF·TV = CD·TV; again, BC : OC :: BE : OR and OR = NE = LT; also BE = FG = LV. Hence BC : OC :: LV : LT, and by conversion BC : BO :: BE : TV; of consequence BC·TV = BO·BE. Therefore,

OS·BC = BO·CD
CD·TV = BT·BE
BO·BE = BC·TV

Hence OS·BC·CD·TV·BO·BE = BO·CD·BT·BE·BC·TV, consequently OS = BT. But $P^2 = BL^2 = BT^2 + LT^2 = OS^2 + OR^2$..

Cor. 1. When the circle LM neither cuts nor touches the straight line FK, the problem is impossible. When it just touches, then BL^2 or P^2, and, consequently, $OR^2 + OS^2$ is a minimum.

Cor. 2. Of the two perpendiculars BE·CD, suppose BE not to be less than CD; then, evidently, LT must be less than EB, otherwise the point O would not be in the base BC. Therefore, P must not be less than a perpendicular drawn from B upon the like FK, and it must not be greater than the perpendicular BE.

R. M. A. Woolwich, March 15, 1832.

[Also answered by Mr. Harper—Locus—and R. T. W.]

PARLIAMENTARY REPRESENTATION.

Sir,—When I first read Mr. George Scott's demonstration of the correctness of Lieutenant Drummond's principle of representation, I did not fully comprehend it. Indeed, I was rather inclined to believe, from his second investigation, that it gave more members for Ireland than the amount of taxes and population seemed to warrant. But, upon mature consideration, I found I was wrong. The following arithmetical explanation,

the principle of which I have borrowed from Mr. Scott's first investigation, will, I trust, be fully understood by those who are acquainted with arithmetic only.

It is stated (No. 457) that the whole population of Great Britain and Ireland is 23,993,000, and the amount of taxes £52,764,444; and from Mr. Scott's statement of Lieutenant Drummond's principle, one half of the whole members, viz. 329, are to be returned to Parliament on the basis of population, and the other half from taxes. Now, the population of England is 13,894,000; therefore, 23,993,000 : 13,894,000 :: 329 : 190·52 = number England should return on account of population. Again, the amount of taxes paid by England is £43,258,990; hence 52,764,444 : 43,258,990 :: 329 : 269·73 = number England should return on account of taxes; consequently, the whole number for England should be 190·52 + 269·73 = 460¼. Proceeding in the same way, the numbers for Scotland and Ireland will be 64¼ and 133¼ respectively, and these are the numbers Mr. Scott calculates in No. 457.

Since writing the above I have seen Philo Scott's severe, but just remarks on T.'s solution (459) of the same question. T. should confine himself to his commercial science, and allow political arithmetic to be discussed by those who understand the subject better than himself.

I am, Sir, yours with respect,

A CAMBRIDGE STUDENT.

May 28, 1832.

LIEUT. DRUMMOND'S PRINCIPLE OF REPRESENTATION.

Sir,—The House of Commons will this evening vote 105 (not 33¼) representatives for Ireland; because, upon Earl Grey's (not Lieut. Drummond's) principle of representation, the taxes annually levied by the House of Commons should be calculated in proportion to the individuals from whose pockets those taxes are extracted. The annual tax levied upon man, woman, and child, is in—

England	-	62 shillings	27
Scotland	-	43 -	24
Ireland	-	11 -	35

Mr. "Philo's" algebra is (No. 459):—

$$\text{Population } \frac{381}{2} + \text{Taxes } \frac{539}{2} = 460\tfrac{1}{4} \text{ England.}$$

$$\frac{65}{2} + \frac{64}{2} = 64\tfrac{1}{4} \text{ Scotland.}$$

$$\frac{212}{2} + \frac{55}{2} = 133\tfrac{1}{4} \text{ Ireland.}$$

This gentleman tells us that the population of the three kingdoms is represented by 658. Next, that the taxes levied by those 658 representatives are represented by 658 additional representatives! Now for the most *bloody* equation. By one *coup d'etat* 658 representatives have ceased to exist. Of the remaining 658, 29, and 3-4ths of another individual, are fled to Ireland, to recount to Mr. O'Connell the prowess of—if not the scientific—then the terrible Mr. Philo. *Superbus est nihil sciens!*

Sir, his Majesty's Government have done no injustice to Ireland. If your correspondent, Mr. Scott, to whom I am very much indebted for information, will but take the monstrous liberty to think for himself, unawed by any other authority than truth, which is but another word for science, he will come to this conclusion:—England having instead of 490 representatives, 500, then Ireland should have 106, Scotland 65.

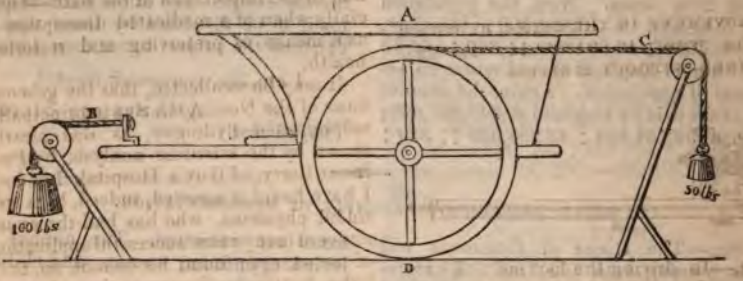
Mr. Philo having said, that commercial science is a very "dry" subject (forgetting that brandy and water is a "commodity") informs us, that Mr. Croker is "a scientific commissioner." Mr. Croker is one of those "scientific" gentlemen, who voted that 20 + 1 = 28 shillings, while the people of the United

States were shouting—"Yankee, Doodle, Dandy!"

I have the honour to be,
Sir,
Your obedient servant,
T.

P. S.—Mr. Scott will readily perceive that should, in the next Parliamentary term, the English revenue decrease, and the Irish and Scotch revenues increase, upon the joint principle of population and taxes, the representation must be either increased or differently distributed. T.

THE FULCRUM OF LOCOMOTION.



Sir,—I beg you will permit one proof more on that much disputed, though now important subject, the "fulcrum of locomotion." I hope it will serve to convince all objectors and set the question at rest, as nothing can effectually be done with the theory until the place of the fulcrum be settled.

Let A, represent a common cart-chest resting upon its fulcrum or axle. In throwing up the cart to discharge a load, or in turning the wheel round to grease it the axle is the support (fulcrum) and centre of motion; but besides these motions, which are statumotive, the cart is capable of another motion, namely, locomotion, requiring a separate or additional fulcrum (support and axis of motion) which is only to be found in successive points on the ground. Let B represent 100 lbs. pulling at the shafts, and C 50 lbs. pulling at the rims of the wheels, two statumotive forces striving to cause locomotion in the cart, or a vibration on an axis of motion at D. Experiment (any one can try it) shows that the 100 lbs. cannot pull the cart forward, being countervailed by the 50 lbs. pulling backward.

Now, how in mechanics can 50 lbs. counteract 100 lbs., but by operating on a lever at twice the distance from the *fulcrum—and where* must the fulcrum be, that C may be twice the distance from it that B is? On the ground at D, of course; it is a lever of the second order to the power C. (See page 8, vol. 16.)

This, I think, is a home proof, and, coupled with Hezron's happy illustration at page 56, ought to decide the point. I shall bear in mind his note at page 59, and shall be happy to see his remarks on the crank, and on the different positions of the cylinder, the results are far from being alike. Reaction, as he says, is sometimes the moving power, or may be so considered; it is so in the machine, page 441, vol. 16. I should feel really obliged if he (or you, Mr. Editor) would find out whether Messrs. Hancock and Messrs. Ogle and Summers can, as stated at pages 462 and 468, vol. 16, maintain a steam pressure of 100 lbs. and 260 lbs., respectively per square inch, on a pair of cylinders 8 or 9 inches diameter, with a boiler of about 8 or 9 cwt., giving a constant force of 13,000 lbs. in one case, and 30,000 lbs. in the other, being equal to about 15 times and 35 times that boiler's weight; I know they may produce almost gunpowder force to start with, but that is not the question. What force can they keep up in travelling? I am inclined to think not 30 lbs. per inch constant available power on such cy-

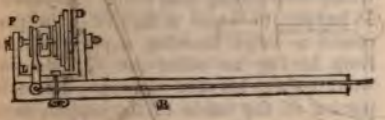
linders; so much for h—mb—g. I would gladly learn how to produce a constant power equal to 3 times the weight of the boiler and its contents. This must surely be a modest request after five year's experience, especially as I am ready to give an order with prompt payment for such a boiler, warranted.

Yours, &c.

SAXULA.

May 21, 1832.

IMPROVEMENT IN THE LATHE, BY WHICH THE WORK IN HAND MAY BE EXAMINED WITHOUT STOPPING.



Sir,—In driving the foot lathe I have always found the hardest part of the labour to be the stopping occasionally to examine the work, and then starting anew. To obviate this difficulty I have invented the improvement represented in the accompanying sketch, which, as far as my knowledge extends, is new.

P shows the poppet head with riggers; D the dividing plate, fixed on the mandril with a small collar betwixt it and the riggers; C a small clutch box; L the lever; R a small rod supported at the far end of the bed connected to R, which enables the turner to throw the riggers out and in gear; allowing them to run loose upon the mandril, so that when examining your work the fly wheel may still go on.

If any of your readers is aware of any similar contrivance, I should be glad to be made acquainted with it, as I am about fitting up a new turning apparatus with the improvement just described.

I am, Sir,

Your obedient servant,

J. WALKER.

Hackney, March 19, 1832.

THE SULPHUR BATHS OF NOTTINGTON.

Sir,—In a communication from me on the Nottington Spa near this town, which you had the goodness to insert in your valuable publication of August 20, 1831, occupying pages 385, 6, 7, and 8, of vol. xv., I alluded in a general way to the estimable (but partially known) curative qualities of this mineral water and the accommodations provided for visitors resorting to it, by Mr. Thomas Shore, the proprietor. I am now induced to write to you again on the subject, from having observed how much the recent pestilential visitation has drawn public attention to the importance of the bath—especially when of a medicated description—as a means of preserving and restoring health.

It may be recollected, that the gaseous basis of the Nottington Spa is principally sulphuretted hydrogen, as was clearly shown by the scientific analysis by Professor Barry, of Guy's Hospital, London. I have heard it asserted, indeed, by a resident physician, who has had the experience of many years' successful application of the water to found his opinion on, that "the Nottington Spring is the only pure sulphureous water discovered in England." If this be correct, Dr. Taylor cannot be said to have over-rated its merits, when he remarked, long ago, that "It deserved to be inclosed in a circle of gold."

When the cholera morbus made its appearance amongst us, Professor Barry was led to direct his attention anew to the properties of this mineral water, to see whether it might not furnish a remedy for this destructive malady; and the result, as will be seen from the following extract from a letter of that gentleman's, which was published a short time since, in a respectable provincial journal, is in the highest degree satisfactory. After remarking on the many remedies which have been in vain had recourse to for checking the progress of this pestilence, Mr. Barry proceeds thus:—"There is, however, a source to which no allusion has been made in any detailed plan of treatment—it is the Sulphureous Vapour Bath. The action of sulphur is two-fold: first, as a disinfectant, and secondly, as a stimulant and one of the least exceptionable, since its action is not violent and evanescent, but gentle yet decided, and by occasional repetition, permanent. The Sulphureous Vapour Bath would fortify the constitution against many depressing causes that might render it susceptible of

cholera. The contagionist does not contend that all those exposed to the contagion of cholera will suffer the disease, but only those whom the absence of an essential degree of constitutional energy shall have rendered susceptible of its influence. It is to destroy this susceptibility, by setting up a vigorous bodily re-action, that I venture to propose the Sulphur Bath. This I do with a perfect reliance upon its efficacy; and from personal observation, I have no hesitation in saying, that from the many instances in which constitutions sinking under the pressure of accumulated disease, were restored to perfect health by the Sulphur Baths at Naples and Paris, it is a remedy that will doubtless become general, when once well understood. It is almost superfluous to add, that these remarks apply to the Sulphureous Spring at Nottington near Weymouth—the application of the waters and baths of which I feel bound in common justice to observe, is identified with the advantages I have here dwelt upon."

It is a source of much gratification, that the alarming effects produced by this dreadful disease are suspended, and its influence on the wane; still it were but wise to be prepared against its recurrence, and it must therefore be useful to know by what means that "constitutional energy," which is its best antidote, may, when wanted, be most surely supplied. Besides, cholera is but one of many possible distempers, which that "fortifying of the constitution" Professor Barry speaks of, has the virtue of keeping at a distance; and cholera or no cholera, I should say to all who are weak in body—*Drink of the Nottington Spa, and be strong.* Trusting this advice will be cordially received from one who has no personal interest in the matter, and is only actuated in this, as in his former communication, by a sincere desire to relieve and soften a few of the many "ills which flesh is heir to."

I am, Sir, yours, &c.

VIATOR.

SOLUTIONS OF COPPER AN ANTIDOTE TO SMUT, MILDEW, AND (?) DRY ROT.

Sir,—The remark you have printed in *small type at the end* of your last number *(May 19, 1832)* touching the prevention of decay in the oaken pump-rods of copper mines in Cornwall, corroborates an opinion I have long entertained, that solutions of copper in every variety have a preservative quality when applied to vegetable substances in a high degree.

Sulphate of copper in solution is used in Flanders by nearly everyfarmer to steep seed corn in; the smut is never known, and the mildew of very rare occurrence. These two diseases arise from the propagation of fungi, as has been proved by the microscopic observations of the late Sir Joseph Banks.

I have made use of this solution of copper for fifteen years past, and have seen neither smut nor mildew in my wheat crop during that time. Moreover, I happen to know a farmer who possessed a large brewing copper, which, from having no other use for, he was wont to steep his seed wheat in; a certain portion of the oxide of the copper, from the action of the salt and wood ashes he used, was doubtless taken up by the water used for steeping, and that prevented his wheat from being infested with smut or mildew, which, before he took the farm was prevalent to a most serious extent.

As all vegetable decay produces fungous plants, which accelerate the destruction of the material they imbed themselves upon, in my mind the action of the copper-mine water, in the instance you produce, is corroborated by its utility in preventing the above-named diseases in wheat and other grain. It is, I am sure, deserving of serious experiment, whether a preparation of some oxide or other of copper, mixed with other materials, would tend to preserve timber in its various uses from decay. Perhaps an oxide insoluble in water, which oxide may be produced by an admixture of arsenic, may prove the most serviceable, if not too expensive, for such purpose.

I am, Sir, yours, &c.

C.

May, 1832.

MORDAN AND CO.'S PATENT OBLIQUE PENS.

"——— A pen,
That mighty instrument of little men!
The pen! foredoom'd to aid the mortal throes
Of brains that labour, big with verse or prose."

Sir,—At the commencement of English Bards and Scotch Reviewers, Lord Byron eulogises his "gray goose quill;"

but had the noble poet lived and written, A. D. 1832, some pen of metal would have been immortalized, and the "gray goose quills" have been

"Condemned at length to be forgotten quite,
With all the pages which 'twas theirs to write."

Pen-making and mending has of old been voted a bore. To make a good pen there are four essential requisites, viz. a good quill, good eyes, a sharp knife, and a correct knowledge of the true principles on which the formation of a pen should be effected. Now as it very frequently happens that all these requisites cannot be obtained in combination, various expedients have been resorted to, from time to time, to supersede their necessity; principally by calling in the aid of ready-made pens, composed of some more durable substance than the quill. For this purpose, metallic pens of forms innumerable, have been resorted to; pen after pen has been tried, metal after metal, but none of those hitherto employed have been able effectually to supersede the quill. The principal defects of former metallic pens, have been their liability to scratch and tear the paper, spurt the ink, and gather fibres from the surface of the paper which clog and choke the pen, prevent the flow of ink, and blot the writing; and, that they do not carry a sufficient quantity of ink.

On the 20th September, 1831, Sampson Mordan and William Brockedon obtained his Majesty's royal letters patent for an oblique steel pen, which is now before the public, and of which the following are correct representations:—

This pen obviates all the defects to which former metallic pens were liable; and embodies a very novel, and at the same time an exceedingly valuable principle; I allude to its oblique form.

It is a well-known fact, that notwithstanding the exertions of the schoolmaster, ninety-nine persons in every hundred fail to attain *permanently the* art of writing with a pen in the true position; *i. e.* with the hand removed a little to the right, and the tip of the pen pointing to the right shoulder, when the slit of the pen will be in the direction of the writing, and both nibs of the pen addressed fairly to the paper.

Messrs. Mordan and Co.'s pen supplies a perfect remedy for this defect, for the oblique direction of the slit being that in which the writing usually slopes or leans, at an angle of about thirty-five degrees, both nibs are brought equally down upon the paper, the writer is not confined to any particular position, but may use the pen freely and without the restraint of attitude directed by teachers of writing.

The greatest possible pains have been bestowed upon the manufacture of the oblique pens, the best steel has been carefully selected for the purpose, and used in a very thin and highly elastic state; the arched or curved form gives the requisite strength where it is necessary they should be firm and unyielding, and also enables them to carry more ink than any other pen; while the nibs possess a flexibility before unknown, and which is obtained by an actual bending of the nibs, and not by their mere lateral separation, as in other pens.

The oblique pen is made of two sizes, as represented above, for different purposes; they may be held in a quill of the proper size, or an elastic steel penholder, but the most preferable is the silver penholder, made expressly for this pen, as it gives a firmness and durability in use, and a facility for changing the pen when worn, which are of great advantage.

Having given these pens a fair trial, I feel much pleasure in expressing my entire satisfaction with their performance;* but as this is a matter in which you are as good or a better judge than myself, I do not choose that my statement should be taken upon trust; I therefore enclose a few pens for your examination, not doubting but that you will agree with the Editor of the Literary Gazette, that the patentee's motto should be

"*Peri*-ant qui ante nos nostra fecerunt."

* The patentees state that they do not intend these pens to last for ever; they will bear two or three days' hard work, and more ought not to be expected.

I may at some future period resume this subject, and offer a few remarks upon the choice and management of pens, ink, and paper.

I remain, Sir,
Yours, respectfully,
WM. BADDELEY.

[We have been in the habit of using the Perryian steel pen, whenever a metallic instrument suited the nature of the work we had in hand—such as arithmetical calculations, correcting closely and crabbedly-written manuscripts, &c., and have been so well pleased with them that we felt no desire for any better. The oblique pens sent to us by our valued correspondent Mr. Baddeley, have convinced us, however, that there was more room for improvement than we anticipated. They are more scientifically constructed than any metallic pens we have yet seen, and we feel bound to say are also much easier to write with; though, certes, they are somewhat ugly to look upon, and come at first rather awkward to the hand. After all, however, commend us to a good Dutch quill for a servant of all work. When well made, which is no difficult matter, you may dismiss all care about the manner of using it, and this you never can do with any metallic pen whatever. It may require mending now and then, but where there is thinking in the case, is none the worse for that; a pause now and then is an excellent fallacy detector, and where there are angry feelings to be assuaged, the more pauses the better.—Ed. M. M.]

THE CROMFORD AND HIGH PEAK RAILWAY.

Sir,—In the Mechanics' Magazine for April, 1832, I find the following extract from Mr. A. Gordon's recent work on locomotion:—

"*The Cromford and High Peak Railway.*—Not one ton of all the great commerce announced in the first account has ever passed on it for the whole distance, and no carriage whatever, except that which conveyed the Committee on their triumphant tour at its opening, all the trade having been confined to a little coal on the southern end."

As superintendant of the Cromford and High Peak Railway, I beg leave to state that since the final completion of that work, a very steady and constantly *improving transit* trade has been *established, in which spring*-waggons, leaving each end daily, and running over the distance in from six to seven hours, are regularly employed.

This railway, as you are probably aware, connects the Peak Forest and the Cromford Canals, the latter of which joins the Nottingham Canal and the Pinston and Mansfield Railway; consequently, it forms the most direct and speedy line of communication between the manufacturing and commercial towns of Lancashire, and the populous and extensive counties of Derby, Nottingham, and Leicester; and, as may be supposed, the trade between the former places and the towns of Wicksworth, Belper, Derby, Nottingham, Chesterfield, Mansfield, Newark, Gainsborough, Hull, Leicester, Loughborough, and the places adjacent, is now taking this direction, and thereby reaching its destination from two to six days earlier than by any other existing route, and, as a consequence, at considerably less expense.

The raw material to, and the manufactured article from, the extensive cotton-works of Messrs. Arkwrights, of Cromford, and those of Messrs. Strutts, of Belper—the lead and other mineral products from the mines of the High Peak—the bar and pig-iron, and castings, from the iron-works and foundries of Derbyshire—the limestone, building and paving stone, and slates from the various quarries situated on or near the line of railway—and the "little coal," are amongst some of the firmly-established and daily-increasing branches of trade. The extensive corn trade for the supply of Lancashire, and the general carrying-trade from thence to London and the intermediate places, is also beginning to take this, as the most speedy and economical route, and will, without doubt, shortly form important parts of its traffic. I beg moreover to state, that the proprietors feel the fullest confidence in the ultimate success of the undertaking, and that every thing hitherto "announced" respecting it will be fully verified.

Trusting that your acknowledged impartiality, and the readiness with which you insert communications relative to public works, will ensure this an early insertion,

I remain, Sir,
Yours respectfully,
JOHN LEONARD.

Buxton, May 26, 1832.

NOTES WORTH NOTICE.

"Information is the rain of the mind: without its continual influence, the intellectual soil must soon become dry, parched, and barren."

New Colonization Companies.—The present year seems likely to be more rife of joint-stock companies than any other since the disastrous 1825; but those now announced, instead of being, as then, for any purpose under the sun, take "the form and pressure of the time;" they are all either for the promotion of steam travelling, or of colonization. A prospectus has been issued for a general steam-carriage company, totally distinct from the one already noticed, whose operations were to be confined to the immediate neighbourhood of the metropolis; this, on the contrary, is to extend the blessings of rapid locomotion to all parts of the United Kingdom. The Railway Companies likewise appear to be tolerably flourishing; but the schemes which take the best of all, are those which chime in with the prevailing rage for emigration. The Australian and Van Diemen's Land Companies (now some years established) seem to be sufficient for those distant colonies, but the Canada Company will for the future have to contend with a powerful rival, in the shape of a similar association, which will, however, leave the upper province to its older competitor, and confine its operations exclusively to Lower Canada; it is entitled the British American Land Company, and has been chiefly set on foot by Mr. Galt (Author of Annals of the Parish, and innumerable other works) who was formerly agent to the original company. The new scheme has had brilliant success hitherto, and has been warmly welcomed by the inhabitants of the colony, which it is the object of its promoters to improve. Besides this, a New Brunswick Land Company has also been announced, and within these few days, a Central American Company. We are afraid so many speculations will only tend to the ruin of each other; but at any rate, they present no insignificant "sign of the times."

A truly wonderful Project.—The May number of the United Service Journal contains a paper on the subject of Marine Railways, by the *ingenious* author of that in a former number on the junction of Ireland and England by means of filling up the sea! This new project is worthy of the proposer of the former. Ships of burden, with full cargo and all masts and sails standing, are to be hoisted from the sea on a railway, whereon they are to perform the part of locomotive-carriages, and, by way of entering London with some effect, they are to pass—hey, presto!—under the Thames Tunnel!! which, we should not omit to say, is to be a *little* widened and heightened to admit them! The best of the fun is, that many worthy editors of country papers are in ecstacies at the project, and the former one of the same mad wag (he must have a fine laugh in his sleeve) is hailed, in all seriousness, in a recent number of a French periodical, as a case in point of the wonders *to be* effected by the enterprise of English engineers!

Cleopatra's Needle.—This famous obelisk has been *our* property for the last thirty years or so: it was presented at the beginning of the century to the British nation by the Pacha of Egypt, who, at the same time, gave the fellow-column to the French. Neither, however, have taken the trouble of fetching home the present, although it has often been talked of. At length, however, it seems, our neighbours have determined upon importing theirs, having sent a ship to Alexandria for that purpose: and it is not unlikely that we shall soon follow the example, although the expense—estimated at fifteen thousand pounds, is no trifle. All this sum, however, is not wanted; for it is a singular fact, and a convincing proof that our soldiers and sailors are not so indifferent to art and antiquity as they are generally thought, that no less than seven thousand pounds were subscribed towards the removal of the needle, by our army of Egypt and the accompanying navy; a sum which has ever since remained at interest, unappropriated, although it is now probable, that, by the aid of parliament, it may shortly be applied in furtherance of its original purpose.

Locomotion Abroad.—Shall any part of the British dominions be less civilized than those of the Pacha of Egypt? Forbid it British enterprize! Sir Wilmot Horton, who a twelvemonth ago was lecturing on Political Economy at the London Mechanics' Institution, is now Governor of the Island of Ceylon, where he had no sooner arrived than he began a variety of improvements, the most striking of which was the introduction of a regular English mail-coach to run between Colombo, the seat of government, and Candi, the chief town of the interior: so that, allowing for the time necessary for the spreading of the news to England, he doubtless had the start of poor Mehemet Ali (vide last Notes). Sir Wilmot

was also bestirring himself to restore the trade in indigo of the interior of Ceylon, which was formerly celebrated for its superiority in that article.

Death of the Chemist Serullas.—The French have to deplore another loss to science, immediately following that of their great naturalist. The name of Serullas is indeed of far inferior fame to that of Cuvier; but it is one which could ill be spared. He was a member of the Institute, first physician to the Hospital of Val-de-Grace, and, after Gay-Lussac, one of the most eminent chemists of modern France. His reputation rested chiefly on his researches into the nature of brome. Serullas was engaged in his usual pursuits till the last, having very recently read before the Academy of Sciences an interesting account of some new experiments on chlorine made by himself. He fell a victim to the cholera, which attacked him immediately on his return from attending the funeral of Cuvier, at which he was present in common with most of the living scientific characters of Paris.

The Press and Public Institutions of Canada.—The periodical literature of free states always furnishes a valuable key to the character and pursuits of their inhabitants. Even a mere enumeration of their titles is sometimes sufficient to give a considerable insight into these interesting points,—a fact which will be sufficiently manifest from the following list of the periodicals of Canada:—

At Quebec, the only literary food consists of four newspapers: the Quebec Gazette (the official journal); Neilson's Quebec Gazette, the first paper published in the colony, which was established in 1764, and was for some years the organ of "authority," a privilege forfeited by an over-display of independence: the Quebec Mercury; and the Star: all these are published twice a-week, except the Gazette, which appears weekly.

Montreal is the literary capital of Canada, having to boast of two monthly magazines, one in English, the Canadian Miscellany, and the other in French, La Bibliothèque Canadienne, besides a religious work, appearing every two months, with the title of the Christian Sentinel; its newspapers also double in number those of Quebec, consisting of the Montreal Gazette (by authority), the Montreal Herald, the Canadian Courant, the Canadian Spectator, the Irish Vindicator, the New Montreal Gazette, and two in French, La Minerve, and Le Spectateur Canadien; all are published twice a-week, except the New Gazette, which is a weekly paper. The only provincial journal yet established is the British Colonist, which appears weekly at the flourishing town of Stanstead.

The public institutions of Canada are highly creditable to that rapidly-rising colony. No less than nineteen (out of about seventy) are devoted to literature and science, including colleges, libraries, agricultural societies (of which there are branches in the various counties) medical associations, &c. In addition to these, there are fifteen societies exclusively for the promotion of education among the poorer classes, by the establishment of Sunday, National, and other schools; fifteen benevolent institutions, as hospitals, infirmaries, orphan asylums, and societies for the relief of destitute emigrants; six tract and bible societies, and five masonic lodges. Fire is so dreadful a scourge in the wood-built towns of the Canadas, that there are four large fire-clubs; whilst there are so many better opportunities for the employment of a little capital than lending it at interest, that the whole colony contains but two savings-banks.

F. H.

Candles brightest in a Cluster.—Count Rumford found that when a number of flames were brought near each other, the light given out increased in a much greater proportion than the temperature. Mr. Baden Powell, who made some experiments in verification of this fact, states, that when two flames were united the light was more than doubled, while there was by no means a proportional increase of radiated heat.

How to become Short-sighted.—A person with the best sight may make himself short-sighted by merely wearing concave-glasses. I have met with some simple young gentlemen at college who produced the disease by this affectation, and became permanently short-sighted. The retina, accustomed to the stimulus of light sent from very close objects, becomes insensible to those more remote, and, consequently, less powerful. Hence watchmakers are short-sighted, and sailors the reverse.—*Dr. Reade.*

Canal from the Nile to the Red Sea.—According to estimates made by some distinguished French engineers, the whole expense of a deep canal which should connect the Arabic gulf with the Nile and the Mediterranean, make Africa an island, and shorten the voyage from Marseilles to Bombay one-half, would not exceed £700,000; a sum considerably less than has been expended on some single works of the same kind in Great Britain.

Light.—The imponderable element, light, apparently enters into combination with, and probably constitutes a part of all mineral as well as of all vegetable substances. Dr. Brewster, in performing some very ingenious experiments on the phosphorescence of animals, found, that upon placing a fragment of corbonate of lime upon a thick piece of iron, heated below the point of ignition, it emitted light of a yellowish colour; whilst from

other minerals, the colour of the light was in some cases blue, in others scarlet, &c., clearly evincing the combination of light with mineral substances. It is also remarked by Dr. B., that this light differs not in its properties from that which is emitted from the sun.—*Detrosier's Address to the Bankxian Society of Manchester.*

Cheltenham in London.—If a few pieces of silver coin be alternated with pieces of sheet iron, on placing the pile in water it soon acquires a chalybeate taste and a yellowish hue, and in twenty-four hours, flakes of oxide of iron appear. Hence, by replenishing with water a vessel in which such a pile is placed, after each draught we may have a competent substitute for a chalybeate spring. Clean copper plates alternating with iron would answer, or a clean copper wire entwined on an iron rod; but as the copper is apt to become oxidated, it is safer to employ silver.

Country without Rain.—In that part of Peru called Vallies, which lies on the north and south side of Lima, in south latitude 12°, bounded on the east by the Andes, and on the west by the Pacific Ocean, it never rains at all. But during winter the earth is covered with so thick a fog as to intercept the rays of the sun. This fog appears almost every day during winter with a density that obscures objects at any distance. About ten or eleven o'clock it begins to rise, but without being totally dispersed, though it is then no impediment to the sight, intercepting only the direct rays of the sun by day and the stars by night. Sometimes it is so far dispersed, that the disc of the sun becomes visible, but the heat from his rays is still precluded. In the winter season these vapours dissolve into a very small mist or dew, which they call garua, and thus every where moisten the earth. These garuas never fall in any quantities sufficient to damage the roads or incommode the traveller; but they render arid and barren parts fertile. They convert the disagreeable dust in the streets of Lima into mud. Now, in that country the wind always blows from the south, that is, from a colder to a warmer region. Sometimes it veers a point or two to the east. But it always blows between the south and south-east. When the fogs come on the south-wind is barely felt, and a scarcely perceptible air seems to come from the north, which forms the fog. The obvious reason why it never rains in that country is, that the wind constantly blows from a colder to a hotter part of the world. We see also the cause of the fogs; they are occasioned by the mixture of the hot air from the north with the colder air from the south.

Hot-Air Blast.—Institution of Civil Engineers, May 1.—The question submitted for discussion was, "How far the hot-air blast has been found to supersede the necessity of coking the coal used in smelting iron?" Various statements were made of trials with heated blast at different iron-works. Amongst others the Clyde Iron-Works were alluded to, at which place the practice has been in use since 1829, and the result has been the introduction of the proportion of coal for the manufacture of one ton of pig-iron, from eight to five tons. It was remarked that the "water-blast," although easy in the management, possessed an inconvenience in an essential part of its construction which was likely to bring it into disuse. It is found that the condensed air has the property of taking up a considerable portion of moisture at the time it is exposed to the large surface of water in the regulator, and the introduction of moisture into a furnace is known to have an injurious effect both on the working of the furnace and the quality of the iron produced.—*Athenæum.*

Crystals in Living Vegetables.—Naturalists have repeatedly noticed the appearance of crystals in the internal parts of vegetable tissues; but nothing very explicit or certain has been stated respecting them. M. Turpin, however, has recently discovered in the cellular tissue of the pith and bark of an old trunk of the Cereus Peruvianus, in the Garden of Plants at Paris, where it had been growing one hundred and thirty years, numerous radiant groups of well-formed crystals. They are white, transparent, four-sided prisms, with pyramidal terminations, and have been found on examination to consist of oxalate of lime.

Health of London.—It has often struck me that when the obstructions in the Thames at London Bridge shall be removed, and the water suffered to flow down with the tide, so much of the muddy bottom of the river will be exposed to the summer sun, that fevers may be engendered in London. I am aware that engineers say the river will then scour itself; this remains to be proved. We do know that since the fire of London, and the keeping back the water by sluices and water-works at London Bridge, London has been free from the plague and other epidemics, and is, perhaps, at this time as free from fever and ague as any town in Great Britain.—*Mr. Nathaniel Gould.*—*Picken's Canada.*

Remarkable Wooden Bridge.—Near Rochester, one of the most considerable towns in the State of New York, there are the remains of a bridge over the Genessee river, called Clyde Bridge, which when entire was altogether unrivalled by any thing of a similar kind, either in America or Europe. It consisted of a single arch of 352 feet span, and 196 feet high from the surface of the river. It was 718 feet long, and 30 wide, and though the whole structure contained more than 130,000 feet of timber, it was completed by twenty workmen in the space of nine months. Dr. Howison, who visited it two or three years ago, gives the following description of its now ruined state:—"The road I took led me to the edge of the cliffs that confine the Genessee river. This stream roared 90 feet beneath me, and a half arch stretched far above my head, as it were, 'suspended in mid air,' while on the opposite cliffs, heaps of planks, shattered beams, and many massy supporters, lay in horrible confusion, being the remains of that part of the structure which had fallen. Nothing can exceed the exquisite, the elegant proportions, and the aerial magnificence of that half of the bridge which is still entire. Its complicated architecture, the colossal span of its arch, its appalling height above the surface of the water, and the noble scenery around, fill the mind with astonishment. A little way up the river, the lesser Genesee falls rush over broken rocks; while the woods which bound the prospect on all sides, and darkly overshadow the hoary cliffs, communicate a wildness to the scene that makes the imaginative spectator almost believe that the bridge above him has been raised by the spells of a magician rather than by the hands of man."

Diak Swords.—Having but briefly mentioned the excellence of the iron and steel of those people (the Diaks), it may not be amiss to say something more on the subject, it being but little understood how much the Diaks excel in those articles. The iron found all along the coast of Borneo is of a very superior quality, which every person must know who has visited Pontiana or Sambas. At Bangermassing it is, however, much superior; they have a method of working it which precludes all necessity of purchasing Europe steel (excepting for cock-spurs, which they prefer when made from a razor). But the best iron of Bangermassing is not equal to that worked by the rudest Diak: all the best kris blades of the Bugis rajahs and chiefs are manufactured by them; and it is most singular, but an undoubted fact, that the farther a person advances into the country, the better will be found all instruments of iron. Seljie's country is superior in this respect to all those nearer the coast; his golloks, spears, and kris blades are in great demand. I have counted forty-nine forges at work merely in the campong of Marpow; but the mandows and spears, which he uses himself and gives to his favourite warriors, are obtained further north. Those men whom I have noticed living in a state of nature, building no habitations of any kind, and eating nothing but fruits, snakes, and monkeys, yet procure this excellent iron and make blades, sought after by every

Diak, whose hunting-excursions have in view the possession of the poor creature's spear or mandow as much as his head, improbable as it may sound. Instruments made of it will cut through overwrought iron and common steel with ease. I have had several penknives shaved to pieces with them by way of experiment; and one day, having bet a wager of a few rupees with Seljie, that he would not cut through an old musket-barrel, he without hesitation put the end of it upon a block of wood and chopped it to pieces, without in the least turning the edge of the mandow. This favourite weapon he presented to me as the greatest and most acceptable present he could bestow, and I gave it to the governor of Macassar, who, I believe, sent it to his Excellency the Commissioner of Java. I may here mention another proof of their power. In the Sultan of Coti's house, I have myself seen three muskets, formerly belonging to Major Mullen's detachment, which were each cut more than half through in several places by the mandows of the party which destroyed them. I once mentioned this circumstance to Seljie; he laughed, and assured me the mandows used on that occasion were not made of his iron, otherwise the barrels would have been cut through at every stroke.—*Mr. Dalton: Sincapore Chronicle.*

Cuvier.—It has been justly deemed one of the greatest advances in science that a naturalist can now, on the discovery of a fossil tooth, merely by the examination of that seemingly unimportant relic, pronounce with certainty on the nature of the animal to which it belonged, the distinguishing features of its structure, and even the prominent characteristics of its nature and habits. That this has been done, and that too with animals which, like the mammoth and the mastodon, have long disappeared from the face of the earth—that we have been enabled to form in part a natural history of the world before the creation of man—we owe chiefly to Cuvier. The discovery of a few bones, which to our ancestors would merely have seemed testimonies of the reality of the existence of giants in the "good old days of Palmerin of England," and "Amadis of Gaul," has led in our times to an extension of the authentic history of nature, which we could hardly blame those who lived fifty or sixty years ago for regarding as wholly impossible.—*From an excellent Memoir of Cuvier in the Literary Guardian.*

Brain of Cuvier.—We cannot help mentioning the extraordinary development of the brain of the late Baron Cuvier. M. Berard, Professor at the Ecole de Medicin, has compared it with several of the most voluminous brains he could find, and ascertained that its weight was 3 lb. 13½ oz., while none of the others exceeded 2 lb. 12½ oz.—*Paris Paper.*

Wood for Bows.—The superior value of foreign yew as a bow wood is recognised by various ancient statutes. In the time of Richard III. merchants were obliged to import four bow staves for every tun of Malmsey or Tyre wine, and those of 6½ feet long were free from all duty. Spanish and Flemish yew was in great esteem, but the best yew for bows was that imported from Venice. The act of 8 Eliz. cap. 10, directs, that when a bow of English yew is sold for 2*s.*, a bow of foreign yew may be sold for 6*s.* 8*d.* Mr. Ainsworth, a bowyer, living at Walton-le-dale, near Preston, lately sold two self-bows made by himself of Spanish yew, one for 8*l.*, the other for 10*l.* Amongst other foreign woods which have lately attracted the attention of bowyers, the "dark ruby" stands pre-eminent. It is a native of the East, difficult to be obtained, and much prized. The "tulip wood" and "cocoa wood," the "thorn acacia," the "purple wood," and the "rose wood," when backed with fine white hiccory or horn beam make excellent bows. The laburnum, when well selected, is beautiful to the eye. In its grain it resembles the feathers of the partridge, from which circumstance it is *sometimes* called partridge wood. This, with an *interveaing slip of quick* casting wood, and backed with hiccory, will make as good and as handsome a bow as an archer need possess.—*Hastings' British Archer.*

Steam Boiler Deposits.—Institution of Civil Engineers, April 3.—In the case of the saline deposition, which accumulates in boilers during sea voyages, it was mentioned as the usual practice, merely to blow off a portion of water from the boiler according as it becomes saturated. In short voyages of three or four days, this is found sufficient for the purpose; but for vessels crossing the Atlantic, or on other long voyages, a more efficient plan has been resorted to, by attaching an apparatus to the engine which pumps out brine from the bottom of the boiler, at the same time throwing in a quantity of clean water equal to what is abstracted. The degree of saturation is indicated by means of an attached thermometer; 218 degrees Fahr. being the boiling point of clean sea water in a steam engine boiler, a range is allowed from that to 227 degrees, which marks the limit of saturation admissible for a steam boiler to be worked with safety.—*Athenæum.*

MR. BABBAGE.

Mr. Babbage presents his compliments to the Editor of the Mechanics' Magazine, and begs to call his attention to two incorrect statements in the last Number of his journal, p. 114.

Mr. Babbage is not a member of the Guelphic Order; nor has he ever derived the *slightest pecuniary profit* from superintending the construction of the Calculating Engine, which is the property of Government.

It has, on the contrary, entailed upon him considerable expense, and has occupied his time during nearly the whole of the last ten years.

Dorset-street, Manchester-square,

May 31, 1832.

[We thought we had seen mention made of Mr. Babbage as one of a mob of gentlemen on whom the Guelphic Order had been bestowed; we are glad to find we were mistaken, and cordially congratulate him on his having missed the paltry distinction. It was never our intention to impute to Mr. B. that he was a pecuniary gainer by the grants made by Government on account of the Calculating Machine; all that we meant to convey was, that a Government which has contributed so liberally to a merely experimental speculation, could not be so indifferent to the interests of science, as the party of declinarians, to whom Mr. B. has rashly lent all the weight of a distinguished reputation, would have the world to believe.—ED. M. M.]

INTERIM NOTICES.

All Advertisements for the covers of the Monthly Parts are requested to be sent to the office on or before the 25th of each month.

We have not the work which Mr. Thomas Heath speaks of, to refer to; but if he will send us a copy of the article which appeared in it, we shall not fail to do him every justice.

Communications received from Mr. Batley—Ratio—Mr. Saddington—Swift—H. E. F.—Mr. Fortune.

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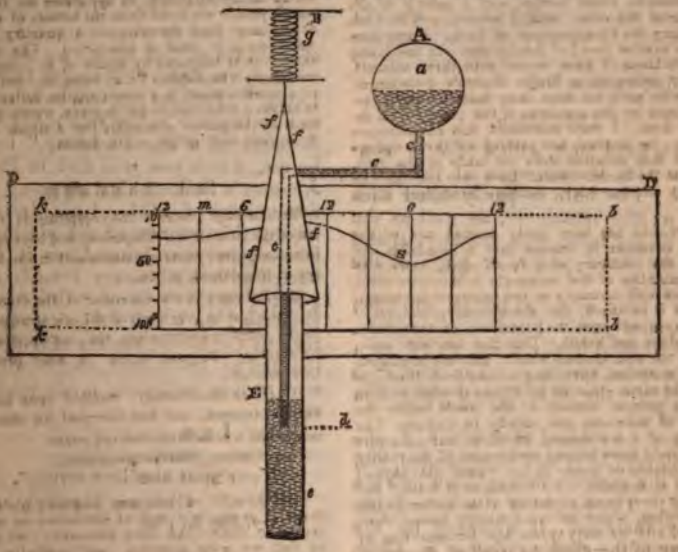
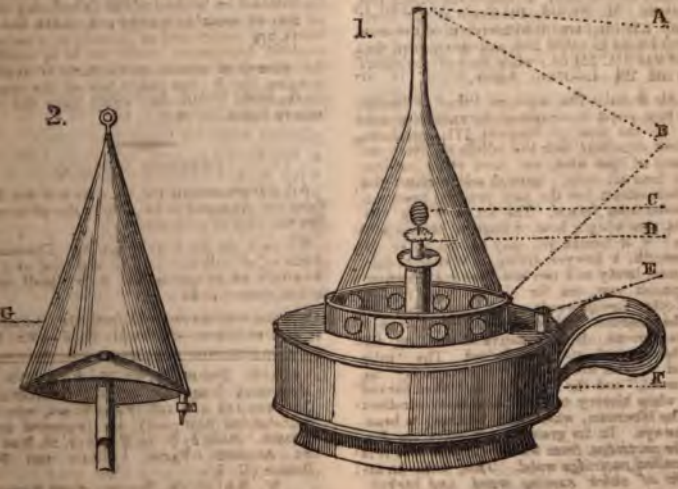
DAVY'S THERMOMETRIC REGISTRAR.



MERRYWEATHER'S PLATINA-LAMP.



THERMOMETRIC REGISTRAR.

The following is a description of an instrument intended as an improvement upon the present registering-thermometers. The principle of that part of the contrivance which is, I believe, new, may obviously be applied to the barometer, &c.; in fact, we may thus construct an instrument which shall keep almost a complete meteorological diary. On the same principle we may perhaps construct a self-acting regulator of temperature for ovens, hot-houses, &c.

Description.

A is a fixed bulb, with a tube in connection with it *c c c*, open at the lower end, *d*. The bulb is partly filled with air at *a*; the remainder, as well as the whole of the tube, with mercury. B and D D, are fixed points, or parts of the frame-work.

E is a tube, closed at bottom and open at top, and partly filled with mercury. It is suspended by the wires, *f f f f*, on a delicate spiral spring, *g*. The tube, *c*, is inserted into the tube, E, and plunged in the mercury.

If heat be applied to the bulb, A, the air contained in it will be expanded, and part of the mercury driven down into the tube, E. The weight of the latter being thereby increased, it descends by the yielding of the elastic spring at *g*. Cold, of course, produces the opposite effect.

A piece of paper, or card, previously marked as represented at *h m*, is fixed to a plate, which, by means of clock-work, is moved horizontally from *k* to *l* in the course of 24 hours. This paper is divided at *h* into degrees as on a thermometer from 10 to 100 Fahrenheit; and at *m* it is divided by the hours (or minutes) of the day.

To a sliding-plate attached to the tube, *c*, or wires, *f f f f*, is affixed a small Mordan's Pencil, with a slender spring to keep it sufficiently pressed against the paper, to produce a mark as the latter moves horizontally.

The temperature will thus be registered on the paper, as represented by the waving line, *s s*.

The instrument must, in the first instance, be adjusted by a common mercurial thermometer; and its indications compared throughout the scale, which *may require to be* divided by unequal *interrals, in order to* make it correspond.

Perhaps some modification of a metallic thermometer might very advantageously be substituted for the mercurial contrivance; the instrument might then be placed in any position.

E. DAVY.

350, Strand, May 3, 1832.

MERRYWEATHER'S PLATINA-LAMP.

Sir,—I find in your valuable journal of the 14th of last month an account of a lamp called "Potter's Polychrest Lamp." Perhaps you will be so obliging as also to place before your readers "An Account of a Platina Lamp," invented by me, which you will find in Professor Jameson's Philosophical Journal for the first quarter of 1831. I am desirous of having this account of the platina-lamp inserted in your journal, as it is connected with a discovery I made the beginning of this year on "Uniform Temperature," on which subject a paper was read to the Royal Society of Edinburgh the 2nd of last month, and of which, as soon as it is published, I will send you a copy.

I am,
Sir,
Your most obedient servant,
GEORGE MERRYWEATHER.

Whitby, May 29, 1832.

ACCOUNT OF A PLATINA-LAMP INVENTED BY GEORGE MERRYWEATHER, ESQ. OF WHITBY, CONTAINED IN A LETTER TO PROFESSOR JAMESON, DATED MARCH 5, 1830.

(For illustrative Engravings, see front-page.)

A few years ago Sir Humphry Davy made the discovery, that, if a coil of small platina wire be placed around the wick of a spirit-lamp, and rendered red-hot, the wire would continue ignited for a length of time after the flame was blown out. In consequence of having lately witnessed this singular phenomenon at Professor Hope's lectures, and that it was generally viewed as nothing more than an amusing experiment, I was induced to give the subject some attention, as I felt convinced that a mode might be devised of turning it to some useful purpose.

On the 3rd of last month I contrived an apparatus; but not meeting with the success I expected with platina wire, I made use of spongy platina, which I found to answer the object I had in view. In order that a correct idea may be formed, I have made a drawing of this apparatus

The lower part is constructed of tin, in the body of which is the reservoir, large enough to contain a quart of alcohol. The bottom of the interior of the reservoir is concave, in order that the cotton-wick may take up the last drop of the spirit. After the wick has been spread in the form of a coronet at the top of the lamp, the platina wire cage, containing one piece of spongy platina, is to be pricked in to the centre of the wick, and to be kept nearly in contact, but not to touch it. After the reservoir has been filled with alcohol, the wick is to be inflamed, and a minute afterwards the spongy platina will have become incandescent, when the flame is to be suddenly blown out, and the glass cover to be immediately placed over the platina. Without any further care or attention, the platina ball will keep ignited for thirteen or fourteen days and nights. A similar apparatus has been kept ignited for this period in the University of this city. If a tube is connected with a reservoir (containing a sufficient quantity of alcohol) and the bottom of the reservoir of the lamp, I have no hesitation in saying that the platina ball may be kept ignited for years, as the spongy platina does not appear to be in the least deteriorated by being kept in a state of constant ignition.

I had a similar lamp made, on a small scale, to keep ignited from eight to ten hours, which affords sufficient light to show the face of a watch in the dark of night. It causes no annoyance from a glare of light. If a light is required, the glass cover is to be elevated, and the platina, gently touched with a match of oxy-muriate of potassa, which will be instantly inflamed; and it is no small recommendation, that there is not the least danger to be apprehended from fire.

There have been two objections to this lamp, which were formidable ones—namely, the expense of the alcohol, and the odour which is diffused through the apartment in which it is placed. As a remedy for the first, I find by experiment, that equal parts of alcohol and whisky answer quite as well as pure alcohol; or even one-third of alcohol and two-thirds of whisky do very well, which I find, on calculation, to cost about one penny for eight hours. As a remedy for the second objection, I have contrived an apparatus for condensing the vapour, of which I have made a drawing. In order that it may be correctly understood, I have represented it as transparent; but the apparatus is made of tin, which is to be suspended from a nail in the wall, fig. 2, G. The glass tube of the lamp is to be inserted into the tin tube of the condensing-apparatus, which will *completely destroy the* strong odour of the vapour. The liquid is drawn off by the stop-cock, at the side of the condenser, which will be found a compound of water, acetic acid, and some other peculiar ingredients given to it by the platina.

We may add, that this lamp may prove very useful in all mining districts, as a constant light that may be depended upon, if the reservoir is periodically replenished. If this should be the result, I shall feel myself amply repaid for all the pains I have taken.

Fig. 1.—A, vent for the vapour; B, glass cover; C, platina ball; D, cotton wick; E, holes for the admission of air; F, reservoir.

LONDON PAVEMENT.

Sir,—Mr. Baddeley is not borne out in his theoretical inference regarding the pressure sustained by paving-stones when a heavy wheel rolls over them. It is a very small portion of the periphery of a waggon-wheel which impinges on the stone at one instant of time; and as the contact must first be on the edge or end of each stone, the opposite edge, or the reverse end, must be raised up; the larger the stone, the more forcibly must it be raised by the pressure of the wheel. That this raising or displacement of the stone does actually take place, a very superficial observation of the new pavement in Fleet-street will show. And that the larger the stones are which form the pavement, the more they are liable to this objection, will be proved by the little durability shown where grooved and cross-grooved broad paving-stone, four times the size of the granite blocks now in general use, have been laid down by way of trial; for example, near Temple Bar and in Barbican. The holes and hills of these specimens were absolutely dangerous at every step, and the more so from its being impossible to avoid them. That my proposition to use smaller stones is likely to prove beneficial in the wear, notwithstanding Mr. B.'s fear of them, will be seen when I instance the old piece of paving leading from the corner of Newgate-street, by the small obelisk, to Skinner-street, which was lately taken up to make way for the new fashionable large granite. That piece of carriage-way sustained as great traffic as any street pavement I am acquainted with;

yet it was less out of repair than any pavement I ever saw, and the ease and good footing for horses was admirable. What would small-sized pieces of granite then do if of uniform depth, and fixed on a solid underground foundation? Surely nothing could be devised better adapted for carriage-way pavement. The size need not be uniform (so as not to square above four inches;) nor the shape, that is, whether triangular, quadrangular, or any other number of sides. They should roughly touch or press upon each other at the sides, and by no means be too nicely pointed. Above all, the conical or wedge-like form downwards should be avoided, as in the wearing away of the upper surface the interstices become larger, and the stones are more liable to work loose; this is shown in the present pavement.

If Mr. B.'s observation respecting the expense is not answered by my remarks above made, surely the loss of life and limb, and the consequent expenses attendant on such accidents, must be taken into consideration. It is the same public which bears the expense, whether it happens in the one way or the other.

I doubt not but I shall see my proposed improvement tried by some of the commissioners of paving who indulge in riding on horseback or driving through the streets; and I have much less doubt that it will be highly beneficial, and a valuable saving to the public if adopted.

A WORKER OF HORSES IN LONDON.

May 22, 1832.

CLAIM OF THE FRENCH TO THE INVENTION OF THE STOCKING-FRAME.

In a paper of "*Considerations sur le Commerce de la Ville de Lyon*," by Dr. Ozanam, published in the last Number of the *Recueil Industriel*, we meet with the following passage:—

"The word hosiery (*bonneterie*) is a generic term, under which are comprehended all articles fabricated by the knitting-needle or frame, such as stockings, pantaloons, &c. It was not till the eleventh century that this art was introduced into France, first at Paris, then at Lyons, and thence into Languedoc. Henry II. wore at the nuptials of his *daughter the first pair* of knitted silk *hose ever seen in France*. Before that time the stockings were made of linen or woollen cloth sewn together. In 1650, a journeyman locksmith, in the neighbourhood of Caen, invented the knitting-frame. He presented to Louis XIV. a pair of silk stockings manufactured by his machine. The hosiers of Paris, alarmed for the consequences of this invention, managed to suppress it. *The inventor went over to England, where he was well received, and where they soon turned his beautiful discovery to good account.* Thus it has always happened in France, under similar circumstances. The French never appreciate the conceptions of genius till their rivals have proved the utility of them by long practice. Gas-lighting and steam-navigation are also examples."

The French are, for a certainty, the most unfortunate race of inventors in the world. They invent every thing, but get credit for nothing. Ever since they were a people, there has been always some envious neighbour at hand to snatch up and run away with all their good things. The English and Flemings have risen to eminence in the arts and manufactures; but only through stealing inventions from the French, of which the French happened accidentally to overlook the importance. *C'est ce qui est toujours arrivé en France.* Witness gas-lighting—witness steam-vessels—witness steam-carriages—witness power-loom weaving—witness, in short, every remarkable invention of the last five hundred years. Respect for Dr. Ozanam would induce us to say—witness also *framework-knitting*; but there are some objections to this, which require only to be stated to convince even Dr. Ozanam that *this at least* must be suffered to stand as an exception. Dr. O. states that the knitting-frame was invented by a journeyman locksmith of Caen in 1650. But it is matter of authentic history that in 1590, that is *sixty years before*, the Rev. Mr. Lee exhibited to Queen Elizabeth a frame for knitting worsted hose—that in 1596-7, he had so improved the machine as to produce plain silk stockings from it—that early in the seventeenth century the Rev. William Lee, at the solicitation of the celebrated Duke of Sully, removed with the whole of his men into Normandy, and died at Rouen in 1610—that notwithstanding this removal of the art, and of the first practisers of it to France,

it met with so little encouragement there at the time, that all Lee's men returned to England but two—and that in 1650, when the Caen locksmith is said to have invented the stocking-frame, the frame-work-knitters of England were already so numerous, both in London and at Nottingham, that they were petitioners to Cromwell for a charter of incorporation. Dr. Ozanam will perceive that these are facts of a nature which completely destroy the pretensions of his Caen blacksmith; who was, in all probability, only some workman employed to repair the machinery of the two English frame-knitters, who remained in France. But what though the French may be thus obliged to concede to us the credit of the stocking-frame? They have still left to console them, the honour of having invented gas-lights, and steam-vessels, and steam-carriages, and power-looms, &c. &c. &c. &c. &c. &c. &c.

DESCRIPTION OF INCLINED PLANES AT BLAENAVON IRON-WORKS.

Sir,—Your St. Helena correspondent, vol. xvi. p. 337, having expressed a wish to know the particulars of any other inclined plane that matches the one of that island in steepness, I am induced to send you an account of what we have done in this way at Blaenavon Iron Works, near Abergavenny, Monmouthshire.

The first inclined plane I shall mention has been constructed for the purpose of conveying the produce of a mine to the surface. It is about 350 feet in length; for 250 feet it rises at an angle of 45°, and for the remaining 100 feet, at top, the ascent is 2 in 3. The locomotive power is a water-wheel, 29 feet diameter, 2½ feet in width. The plane has been in use for seventeen years, and on an average there have been 200 tons raised per diem. The chains are made with ¼-inch iron; and a pair of chains last in constant work about five years. The weight raised at each time is 3½ tons, including the carriages. There are two roads on the plane, worked by two chains on a 5 feet drum-barrel; consequently, the motion of the barrel is reversed, for the wheel goes always the same way.

A second incline is about 600 feet in length; proceeding partly under ground at an angle of 30°, and partly above at an angle of 2!°. There are two pairs of chains ¼-iron, worked by a water-wheel 40 feet in diameter, that is, there are two chains ascending and two descending at the same time. The weight capable of being brought up at a time by this apparatus, including carriages, is 20 tons, and 400 tons can be worked in 12 hours.

The produce raised to the surface by these two inclines is sent down from the Blaenavon Works by four planes in a line, to the Brecon and Monmouthshire Canal, and also across that canal to the Abergavenny and Hereford Tram-road. On this line of inclined plane there are 2000 yards of chain at work. The bottom of each plane is connected to the top of the next below it, by a short but level piece of road; and a man and boy suffice to effect the transfer of the waggons at each stage. Iron, coal, and lime-stone, are, by means of the first three planes, sent down the Blorange Mountain to the Brecon Canal; while the fourth plane goes over the canal and supplies the town of Abergavenny and neighbourhood, as also Herefordshire, with coal and lime. The first plane is 242 yards in length—angle at top 45°, at bottom about 32°. The second is also in length 242 yards—angle 29°. The third plane is exactly the same length as the St. Helena plane, that is, 308 yards; the angle 28°. The chains of the first plane are of 1-inch iron; of the second and third of ⅞-iron. The fourth plane, which crosses the canal, is 180 yards long, at an angle of 18°. The whole of these planes have been worked nearly 14 years. The chain that the lower plane is now worked by, was the chain first used on the upper plane, and was originally of 1-inch iron, but is now worn down to about ½-inch iron. On particular occasions there have been sent down these planes 250 tons per day, and as much as 50,000 tons have passed, without an accident of any consequence occurring.

The above planes are all worked by endless chains, upon the principle noticed in the Mechanics' Magazine, vol. xi. p. 271. The weight upon the chains, including the going and returning carriages, (when there is no back-carriage) is about 7 tons.

There are many other excellently constructed inclined planes in this mountainous district; but no one has yet found out any method to stop the carriages

going down when the chains break. Any person that could invent something to do this effectually would not only be entitled to the thanks, but also to a handsome reward from all inclined-plane workers. The fact of the St. Helena inclined-plane chain of ¼-inch iron having broken with less than 16 cwt. upon it is a proof that there must be something very bad. If it opened at the shut it was the maker's fault; if any other part of the link broke, it must have been bad iron, unless the links had been damaged before by some accident, for a good ½-inch chain should be equal to 4½ tons up such a plane. There are two pits here, 366 feet deep, worked by a water-wheel 31 feet diameter; the chains are ⅞-iron, and the weight raised each time from the bottom is 4 tons (including the weight of the chain); from 150 to 160 tons are raised daily, and yet the pair of chains now in use have never broken at all. When these chains were made they were shut on the ends, and the shut afterwards turned to the side.

The drums which work the St. Helena plane being only 2 feet diameter, the chain, if the links are long, cannot lap well upon it. I think the drum should be 7½ feet diameter, because the breadth of the roads, from centre to centre, is about that distance. The chain in turning of and on the drum, over the pulley, on the middle of the roads, on the angle or top of the planes, would then traverse square without the help of the rollers, which necessarily cause a considerable friction. The levers should be 21 feet long; this would give the mules more scope; a beast works uncomfortable round a short circle.

But if there is much traffic up the inclined plane, why not use a small steam-engine? Perhaps there is no water at the top of the plane to work the engine with. At the bottom, however, there must surely be a supply, and if so, the engine can draw up water for its own use. Fuel likely is scarce, consequently expensive; that I should consider the only obstacle.

I am, Sir, yours, &c.

THOMAS DEAKIN.

Blaenavon, March 6, 1831.

AMERICAN CARPENTER'S PLANE.

A patent has been recently taken out in the United States by Phinehas Meigs, of Madison, in Connecticut, for a new carpenter's plane, of which Dr. Jones, the Superintendent of the Patent-office at Washington, gives in the Franklin Journal the following description:—

"The objects to be attained by this invention are to cause a single iron to have the effect of a double iron; and to secure or detach it with greater facility than in the ordinary mode of fastening. The plane is, in fact, a double iron plane of a peculiar, and, undoubtedly, a new construction. The opening, forming the mouth of the plane, is mortised through in the usual manner, excepting at the ends, which are perfectly flat, as no wedge is to be used. A plate of iron is let in on each end of the mortise, extending from the top to the face of the plane, and secured in its place by grooves, into which its edges fall, and by a screw passing into the stock. A flat plate of iron, similar to the cap of the double iron, has a pin projecting from each side of it, at about three-fourths of an inch from its lower end. These pins pass into grooves prepared for the purpose on the side-plates, and a joint is thus formed upon which this cap-iron moves; the pins rest upon the bottoms or lower edges of the grooves, which keep the iron at a proper distance from the face of the plane. Near the upper end of this cap-piece there is a thumb-screw, which serves instead of a wedge to fasten the cutting-iron. The cutting-iron is dropped into its place, between the cap-iron and the stocks; when there, the thumb-screw is turned, and its point bearing on the cutting-iron, throws the lower edge of the cap against that of the cutting-iron, and fixes it in its place; the whole bearing being against the pins in the groove."

CROMFORD RAILWAY.

Sir,— I subjoin, from a small pamphlet printed by Longman and Co. on Canals and Railways, a Statement of the Receipts and Expenditure of the Cromford Railway Company to August, 1831, and wish your readers who are possessed of similar *documents, showing* the actual cost of Canals and Railways, would send them to *you for insertion in your* work.

The length of this railway is 32¾ miles from the Cromford canal to the Peak-Forest canal at Whaley bridge. Its summit is elevated 977 feet above the Cromford canal. Locomotive engines are used on the levels, and stationary engines to haul the carriages, with passengers and goods up the inclined planes, and let them down. This line shortens the distance between Manchester and the junction of the Derbyshire canals, with the Trent and Soar, and consequently with the eastern and southern agricultural counties more than one half, viz. 56 miles, instead of 118. There are on it 17 stationary engines. Mr. Josias Jessop was the engineer employed to lay out this railway, and he estimated the cost (including £20,000 for stationary engines to work the inclined planes) at the sum of £155,079 16s. 8d. The act for making it received the Royal assent May 2, 1825. It was obtained by a company consisting of 116 persons, who were incorporated by the name of "the Cromford and Highpeak Railway Company;" they were empowered to raise amongst themselves £164,000 in 1640 shares of £100 each, and, if necessary, the further sum of £32,880, by mortgage of the undertaking. Amongst the first proprietors were the Dowager Viscountess Anson, the Honourable Edward Curzon, Sir Charles H. Colville, and Admiral Digby.

I am, Sir,
Your obedient servant,
* * *

Cromford Railway.

Dr.	£.	*s.*	*d.*
To amount of calls received to this day June 15, 1831 -	127,136	0	0
To amount borrowed on mortgage - - -	31,910	0	0
To tonnage received on the southern part of the Railway	959	11	0
	160,005	11	0

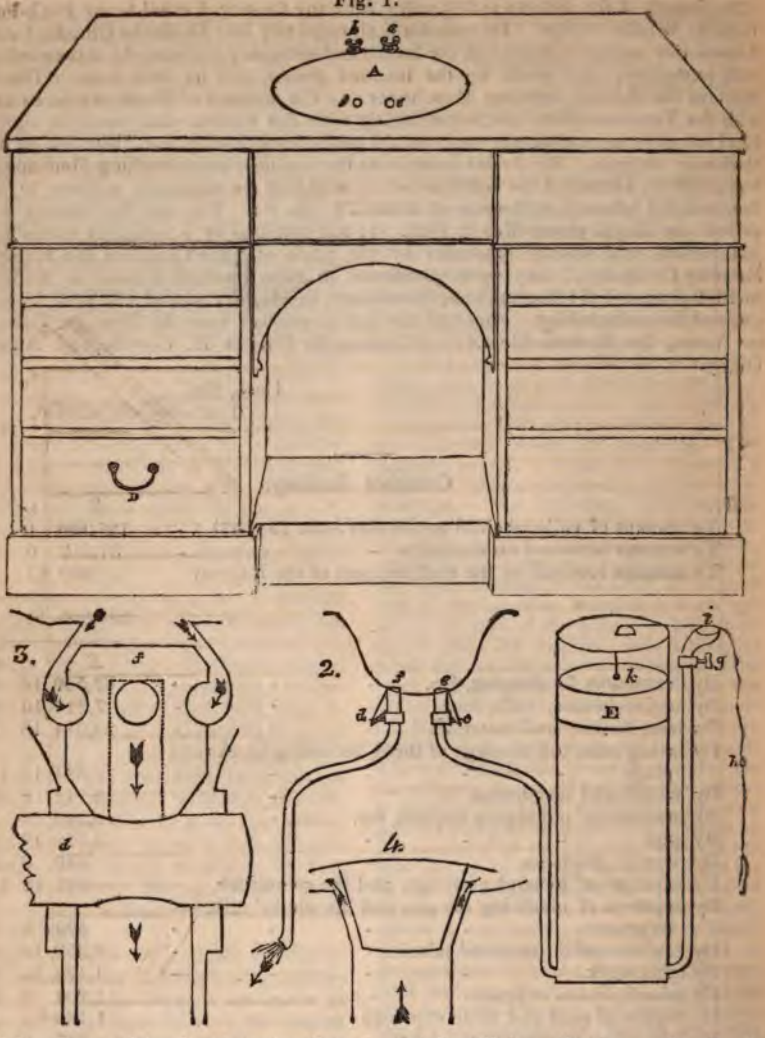
Cr.	£.	*s.*	*d.*
By contractors for forming, &c. - - -	87,540	16	3
By engine-houses, wells, &c. - - -	7,246	10	2
By iron, timber, and materials - - -	21,014	18	8
By laying rails, and carriage of them, including blocks and plugs - - - - -	6,634	15	11
By wharfs and warehouses - - -	2,711	6	10
By machinery, putting-up engines, &c. - -	13,240	18	3
By land - - - - -	4,378	17	4
By tenants' damages - - - -	449	6	5
By expences of general meetings, and the committee -	843	12	11
By expences of obtaining the act, and law clerks' bills and expences - - - - -	499	6	9
By engineers and assistants' salaries - - -	5,359	19	0
By extra work - - - - -	1,174	10	4
By miscellaneous expences - - -	1,784	8	6
By repairs of road and trade expences - -	1,130	15	6
By interest on mortgages and loans - - -	817	2	1
	159,327	4	11
By balance in the treasurer's hands -	678	6	1
	£160,005	11	0

August, 1831.

IMPROVED WASH-HAND STAND.

Sir,—I do not know what the French improvement in the *mode of supplying a wash-hand basin with water*, noticed in your present volume, p. 31, may be, but the mention made of it induces me to send you a description of a plan I have adopted in articles of this description,

Fig. 1.



which possesses this advantage over those in common use, that the cistern, instead of being above, is below the level of the basin; and the hydraulic arrangements are nearly all out of sight.

Fig. 1. A is the basin; *a*, the tap for letting in the clean water; *b*, tap for letting out the dirty water into the drawer, D. Figs. 3 and 4 show the valves on an enlarged scale; fig. 3, those for dirty water, fig. 4 those for clean. To let in the clean water, turn the tap *a*, fig. 1, and it will turn the tap *c*, fig. 2; the weight, E, will then descend and force the water out at the valve *e*, (the valve to rise one-eighth of an inch.) When there is enough in, reverse the tap *a*, and it will shut the tap *c*, and the valve will fall flush with the bottom of the basin. To let out the dirty water, turn the tap *b*, and it will open the tap *d*, when the valve will fall into the opening of the tap *d*, and the water will run into the drawer, D. To fill the cistern open the

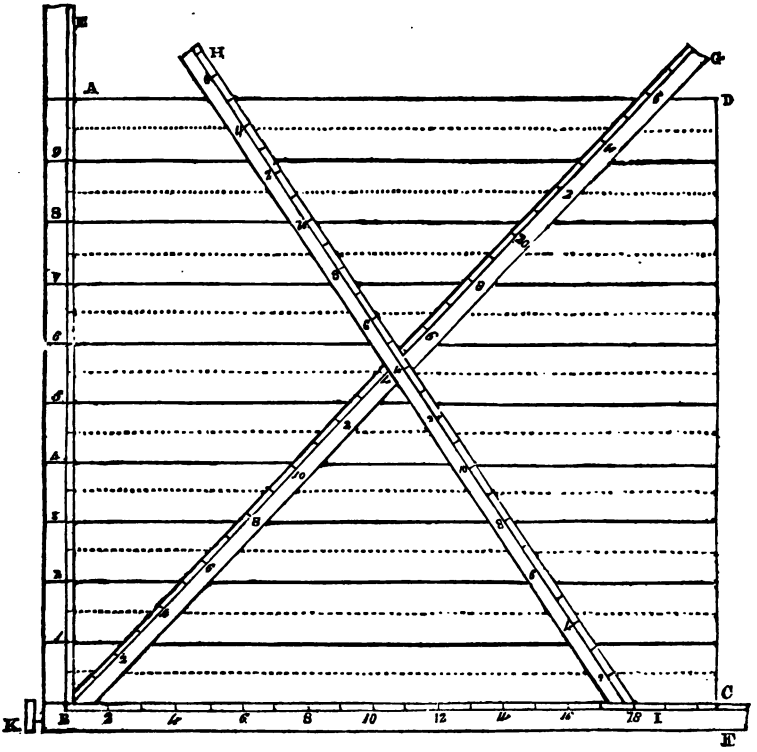
tap *g*, then pull up the weight, E, by the cord, *h*; put in the water at the mouth, *i*, then shut the tap *g*, and put in the cord, *h*, and shut the small door at the top of right-hand side (not seen in the sketches.) The cistern is placed at the back of the right-hand side, and there is thus space left in front for any suitable conveniences. There is also a good deal of spare room on the left-hand side, above the drawer, D. In the weight, E, there is a valve, *k*, to let the air escape when the cistern is filling, otherwise the water would not rise to fill the whole of the cistern.

I am, Sir, yours, &c.

A. M. G. (a Working Mechanic.)

London, April 20, 1833.

INSTRUMENT FOR FINDING THE CONTENTS OF PLANE TRIANGLES.



Sir, — The rule generally used for finding the content of any plane triangle when its sides are given, is well known to be extremely tedious. I am not aware that any mode for the simplification of this rule has at present been adopted; as that, however, is certainly desirable, I am induced to send you the description of an instrument for that purpose which I believe to be new.

ABCD is a square of wood or pasteboard (the larger *it is the more* correct will be the result obtained from it), and BE, BF two pieces fixed to each other at right angles, and each having a groove for the square to slide freely in by either edge BA, BC.

The edge BA is divided into ten equal parts, each of these is subdivided into ten; and from all the points of division lines are drawn parallel to AD, BC; those from the primary points being somewhat thicker than the rest, and those from the middle points being dotted.

BG is a slender straight rod, turning freely round a hinge at B, and IH is another rod of the same length with BG, turning also round a hinge at I, but admitting of being readily brought to any required position on BC, either by means of the screw K, or by means of a bar sliding freely in KF, and fixed at I. Upon BF, BG, and HI, are laid down scales, the divisions on each of which are the half of that on AB. To avoid confusion, only the principal horizontal lines are drawn on the square.

To illustrate the use of this, let us take the simple case of a triangle in which the three sides are 14, 16, 18. Here, by setting the rods to adapt them to this example, as is done in the figure (the longest side being made base) we find that ½ the perp. altitude of the triangle is 5·9; this × by 18 gives 106, the contents nearly in like manner if the sides had been 1·8, 1·6, 1·4; one half the altitude would be ·59, and content 1·06: we may proceed in a similar manner for every other case. The rods are shown as broken off; they may be extended to any convenient length.

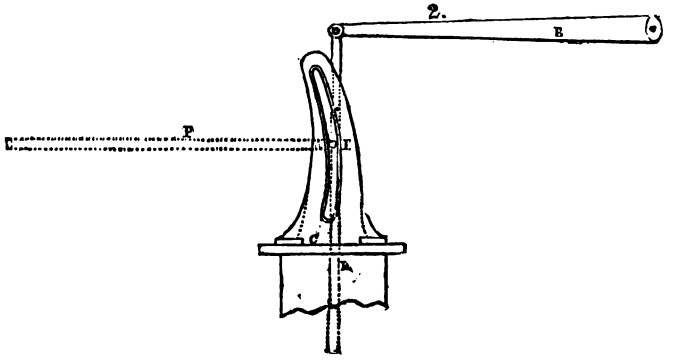
The application of this simple instrument will be much extended if a quadrantal arc be also described on the square; for, in that case, if two sides and their included angle be given, the third side may be determined by inspection, and the content will be found as before.

Other applications might be adduced, but it will be needless to lay them before your intelligent readers.

Yours, &c.

A.

MODE OF DISPENSING WITH THE PARALLEL MOTION IN STEAM ENGINES.



Sir,—As it frequently happens that steam-engines require to be used in situations where the smallest saving of room is of the utmost importance, you will, perhaps, think the following account of a contrivance, by which the long guide rods now in use may be dispensed with, deserving of a place in your useful journal.

In the prefixed figure, B represents part of the beam of an engine; R the piston rod; P the single parallel motion. I propose that there shall be a bracket fixed on each side of the piston, as at C, with a curved groove, similar to what is *described by the radius* P, with a pin, or *a bush neatly fitted to* move up and down. It will at once be seen that this will answer the same purpose as the rod P. Mechanics will probably tell us that such an arrangement would not look well: perhaps so; but I consider that practical convenience is at all times to be preferred before mere elegance of appearance. Others may think that there will be a deal of friction; but this I don't believe, for I have tried a beam with a very heavy weight attached to it, and the friction was scarcely perceptible.

I am, Sir,
Your obedient servant,
J. WALKER.

Hackney, March 9, 1832.

MODE OF EXTIRPATING STUMPS OF TREES FOLLOWED IN NEW SOUTH WALES.

[From an address of Sir John Jamison to the Agricultural and Horticultural Society of New South Wales. For the method here described, Sir John has received the large gold medal of the Society of Arts.]

"In the early part of 1825, 600 acres of forest timber were felled nearly adjoining my house at Regent Ville, and remained untouched until September, 1828, when about thirty labourers were employed to grub up the stumps and to burn off the timber. But, on trial, the long drought had rendered the ground so hard, that hoes and spades made such slow progress in clearing the earth from the roots, and the dry and hardened state of the wood made the execution of by means of axes so laborious and tedious in barking and sapping the stumps and cutting the roots, that this usual method of burning out the stumps was abandoned. But as the above extent of forest was felled for a park and pleasure grounds, and not intended for agricultural purposes, I determined to get clear of the unsightly appearance of the stumps, by burning them off to the surface of the earth with the felled timber which surrounded them.

"As an experiment, twenty acres were ordered to be cross-burnt in the customary way, with riders, into convenient lengths, which, owing to the dry state of the timber, was completed with ease and expedition. A considerable number of logs were directed to be rolled close round each stump, and when completed the entire twenty acres were set fire to on the same evening. The following morning about one-third of the whole stumps had burnt out even to the extreme points of the roots, many feet under the ground; and as the whole were in regular course of consumption, a few men were left to attend to the fires when necessary. Thus, in four or five days, ninety-nine stumps with their roots, out of every hundred, were burnt most perfectly without the use of a cross-cut saw, spade, or axe; and, by this method, more than double the extent of work was performed, and in a much more complete manner, than any other mode hitherto followed could have effected, and certainly with much less bodily labour. This plan was persevered in until upwards of 400 acres were cleared, and the stumps were burnt out in a much more perfect manner than had been before experienced. Some of our honorary members, vice-presidents, and *many members of the Society*, witnessed the progress and effect of the above method of clearing felled forest timber; and as the plan is generally well known and adopted in this neighbourhood, its saving of labour, and many advantages must soon bring it into general use.

"It may be necessary to offer some further remarks in illustration of this method of felling and clearing tracts of forest land in the way described. The soil of the 400 acres cleared was argillaceous, combined with a red vegetable mould, which might be considered of a middling quality of forest ground. The felled timber consisted of iron-bark, box, stringy-bark, gum, and apple-tree, so that it was a perfectly mixed forest. The apple and box tree stumps burned out with the greatest facility and expedition; the iron-bark next, and the gum and stringy-bark slowest. The last, however, burnt out perfectly, though some of them required more fuel and attention than the former.

"I have also to observe, that the wood was felled at that period of the summer when the sap was raised from the roots to the trunks of the trees, to give growth and vigour to the branches and foliage. This is a period of much importance in the economy of clearing land of its forest, inasmuch as the tree is cut down when the stump is exhausted of a considerable portion of its vegetable sap, and, in consequence, the roots very generally die, and dry up the better for burning out. On the contrary, when trees are felled in the winter, the stumps and roots are invigorated with the return sap, and the ensuing spring very commonly forces out shoots from the stumps and suckers from the roots, which keep them alive, and render them difficult to grub up or burn off; besides the additional labour necessary to destroy the young forest, which will spring up by using injudicious seasons in felling wood. It must likewise be acknowledged, that the two seasons of drought not only occasioned an unusual dryness of the timber, but of the earth also, which assisted the success of the plan of burning out the stumps. Besides this, the argillaceous mixture of the soil promoted the burning process; as the earth, ignited by the fire of the logs and stumps, continued its course until the extreme points of the roots were consumed. This experiment establishes a fact, that our former mode of opening the earth round the stump removed that quality of soil driest and best calculated to ignite and conduct the mutual burning influence of the wood and earth, so long as any of the former remained unconsumed.

After the fall of rain, which took place in the middle of the month, the ground became so saturated and the timber so wet, that it was found the success of the plan would be retarded; therefore, during this state, the people were employed in rolling logs round the stumps, and after a few days of dry weather, the fires were again lighted, when they burned with the former facility.

"The above experiment was tried on dead sapless stumps, situated on rich alluvial soil, where it answered to a degree to make me lament having burnt the wood off many hundred acres, and subjecting myself to the increased labour and expense of grubbing the stumps up by the roots, or drawing wood from a distance to burn them out from the surface.

"I feel perfect confidence in the certain success of the method now described to you for clearing forest ground. It will always succeed if the timber has been cut down when the sap is up, and allowed to season from two to three years, when the stumps will be dead, and the timber dry and exhausted of its sap, so as to burn off in the radical way submitted to your notice. But the ground must be dry, and either of argillaceous or rich vegetable mould. Gravelly or sandy soil will not conduct the fire below the surface.

"The economy of the plan will not be so available to new settlers, requiring a spot of cleared ground for immediate cultivation. They must, for the first year at least, follow the old, tedious, and expensive method of grubbing out the stumps or clearing the earth round them, cutting off the bark and the sap, to succeed in burning them out a requisite depth to allow the plough to work over them. But the felling at the proper season such tracts of forest as may be desired to be cleared, will, in the course of two or three years, enable them to adopt with facility the economy and expedition of the method recommended, which is not only important to be known and acted upon in this territory, but in the great forest wilds throughout the globe, where civilized man desires to raise his bread.

"Whilst on this subject, it may be well to explain another method which I have practised in progressively clearing forest pasturage land by felling the young sapling trees and wattles, and burning them and the unsightly standing dead skeleton trees with the quantity of dried felled timber so generally strewed over the forest tracts. Cutting down the young trees admits a freer circulation of *air, and of the sun's rays, to sweeten and improve the quality* of the herbage; and the quantity of food is considerably increased by clearing the naturally fallen trees and branches which are so plentifully scattered on the ground. And besides, burning off the decayed timber destroys many venomous reptiles, dangerous to man and beast; and that which is not the least reward of his plan is the beautiful and park-like appearance which it gives to an estate. The improved quality and quantity of food, following such a system of clearing would amply repay the labour it costs, and if followed up every third year, forest pasturage would be progressively made more valuable and ornamental, at an easy expense."

OGLE'S STEAM ENGINE BOILER, AND THE PRINCIPLES OF LOCOMOTION.

Sir,—Saxula has thought proper to apply the word "humbug" to a statement of Messrs. Ogle and Summers, that they can maintain a working pressure of steam in their tubular boiler, equal to 160lbs. on the inch. My acquaintance with Mr. Ogle is certainly slight, but such as it is, I firmly believe that the insinuation is as unjust as it is uncourteous. Of all persons, Saxula should be the last to make use of such an expression; for his own absurd and absurdly-defended *patent* theory, has been urged again and again with a pertinacity so proof against reason and common sense, as would fully justify a similar imputation, though gentlemanly feeling may not admit the propriety of applying it. Besides, Saxula has incorrectly asserted that the above statement was made by those gentlemen (before the Committee of the House of Commons) in reference to the *cylinders* of their locomotive steam-engine; but if you turn to their evidence, as given in your last volume, you will find that it referred to their boiler. This boiler appears to be much more powerful than Mr. Gurney's, and its arrangements are certainly very ingenious, but I greatly fear that the joints cannot be kept sound for any length of time together. Judging from my own experience of the manner in which joints ought to be managed, I should say, that such a boiler would be constantly getting out of order; but I shall be happy to hear that I am mistaken.

I regret, Sir, to find that Saxula's locomotive fancies are not at an end,

and that the pages of your valuable Magazine should continue to be occupied by matter, which is now so uselessly fallacious. Though I have long since retired from this unfortunate controversy, yet from the circumstance of having originated it, I the more bitterly regret that it should have been so tediously prolonged beyond the point, at which anything new or useful could be elicited.

Though determined not to engage anew in the discussion, I must, just in pity to Saxula, inform him, that his "home proof" in No. 460, as to the place of the fulcrum *in* (not *of*) locomotion, is like every thing else that he has said or done, quite beside the question. Take for instance the profound disquisition and elaborate experimental proof, by which he arrived at the notable conclusion that a long lever is more powerful than a short one. He may recollect that very early in the discussion I told him, that if a boat were moved with an oar by a person *on shore*, the fulcrum of the lever would be in the water; but that if he was on board, it would be on the edge of the boat. Now the case which he has put, is analogous to the first mode of moving the boat. The wheel, or endless lever, is acted on by a power (either the weight B or C as he chooses) which is *not* embarked with the thing moved, but is as much external to it as a horse could be. Of course the fulcrum is on the ground, and no one ever denied it. But then there is no locomotion in the case—a slight oversight this, quite immaterial with Saxula. Let him attach his power to the cart, and he will have locomotion, but a shifting of the fulcrum, from the ground to the axle withal.

I feel indebted to Hezron for the information, that there is one author (Emerson) who assigns the fulcrum of the oar to the side of the boat. It makes it, however, the more astonishing, that so many writers should have gone astray in this particular—a result I suppose of the art of bookmaking.

Yours, &c.

B. CHEVERTON.

ON THE NATURE OF COMETS—A MISTAKE RECTIFIED.

Sir,—I hope I shall at all times receive with due *thankfulness the* well-meant efforts of any gentleman, who, thinking me in error, endeavours to set me right; especially if accompanied with the politeness which distinguishes a communication of this kind by Mr. Wall, in your Magazine of last Saturday.

As I believe, however, and hope to show, that Mr. Wall *is the deceived*, I take the liberty of troubling you with a few observations in support of my former statement, and in reply to Mr. Wall's objections.

When I first stated Mr. Wall to be in error upon a particular point, I had read several works upon astronomy, in which the position I advocated appeared to be fully established; since Saturday last, however, I have consulted upwards of twenty astronomical treatises, which all, without one single exception, clearly and explicitly state the fact as I before described it; viz., "that the lustre and magnitude of comets, is at the greatest just after they have passed their perihelion."

Thus, for instance, the Oxford Encyclopædia says of comets—"The tails appear the largest and brighest immediately after their transit through the region of the sun; that is, after their perihelion. For then their nucleus being the most heated, will emit the most vapour."

The London Encyclopædia observes, "Whether the tail of a comet is caused or not by the heat of the sun, it is always observed to grow larger as it approaches, and to diminish as it recedes from that luminary."

Rees, in his Encyclopædia, lays it down as one of the observed laws of comets, that "their tails appear the largest and brightest immediately after their transit through the region of the sun, or after its perihelion."

In the Pantalogia, the same fact is described in these words:—"Comets appear to advance directly towards the sun, as if they were going to fall into his body; and after having disappeared for some time in consequence of their proximity to that luminary, fly off again on the other side as fast as they came, projecting a tail much larger and brighter in the recess; but, getting daily at a farther distance from us in the heavens, they continually lose some of their splendour, and at last totally disappear."

Professor Vince, in his well-known Treatise on Astronomy, speaking of co-

mets, says—"As they approach the sun, a tail of light, in some of them begins to appear, which increases till the comet comes to its perihelion, and then it decreases again and vanishes."

The following, from the Encyclopædia Britannica, still further illustrates the fact:—"The comet of 1811 was scarcely visible in the months of April and May; it was subsequently lost in the sun's rays, and, having passed its perihelion, reappeared in August with a splendour and magnificence that rendered it an object of universal admiration."—And in another place, "Thus it is remarked, that the tail becomes most conspicuous after the comet has passed the perihelion, and that its direction, as was first observed by Appian, is the straight line joining the centres of the sun and comet."

Carey, in his Artizan, or Mechanics' Instructor, writes thus:—"As comets approach the sun, their light becomes more brilliant, and after they reach their perihelion often exceed any of the planets in lustre. Their tails are also observed to increase both in length and brightness as they approach the sun."

But not to intrude too much upon your pages, I shall confine myself to one more extract, which is from the Panorama of Arts and Sciences, by James Smith:—"From observations of the comet of 1680, Sir Isaac Newton found that the vapour in the extremity of the tail, January 25, began to ascend from the head before December 11th, and had therefore spent more than forty-five days in its ascent; but that all the tail which appeared December 10th, ascended in the space of those two days, then just passed since its perihelion. The vapour, therefore, at the beginning, when the comet was near the sun, ascended with a prodigious swiftness; and afterwards continued to ascend with a motion retarded by the gravity of its particles, and by that ascent increased the length of the tail; but the tail, notwithstanding its length, consisted almost wholly of vapours, which had ascended from the time of its perihelion; and the vapours which ascended first, and composed the extreme of the tail, did not vanish till it was too far from the sun to be illuminated by him, and from us to be visible.

From the great number, and high respectability of the authorities, who advance and support opinions similar to the few which I have quoted, I flatter myself that I may subscribe to such opinions, without having thereby "rendered myself liable to the lash of ridicule;" and I feel myself entitled to call upon Mr. Wall to state to which "of the most eminent astronomers" I am "in contradiction."

With respect to Mr. Wall's reference to a representation of the solar system, I may observe, that it must be evident to all, that the respective positions of the sun, earth, and comet, at a short period after its perihelion—may be such, as for the comet's tail to subtend its greatest angle when viewed from the earth; and this is not only a possible, but a highly probable occurrence.

Neither is a comet during its perihelion *always* on the opposite side of the sun, with respect to the earth; both the comet and its tail are at that time invisible to us, from the overpowering brightness of the sun's rays and their proximity; and not for the reasons given in Mr. Wall's foot note at page 133.

I remain, Sir,

Yours, respectfully,

W. BADDELEY.

June 5, 1832.

EXHIBITION OF WORKS OF PRACTICAL SCIENCE.

An exhibition-room "for the reception and display of works of practical science" was opened this week in Adelaide-street, West Strand (one of the new streets in the vicinity of St. Martin's Church.) The proprietors of the concern state, in a printed circular, "that the object they had in view when their plan was originated was to exhibit some of the many valuable inventions of Mr. Jacob Perkins; and that whilst determining on the accommodation necessary for that purpose, they were led to believe that it would be to a great advantage to individual inventors, and of interest to the public, if the place they were fitting up could be made available for a more extended exhibition of similar subjects." In this, as in other instances, second thoughts proved the best. The notion of erecting, at an expense of many thousand pounds, a hall to exhibit two or three inventions of a particular individual—not all original and some of them mere abor-

tions—was, to say the least, exceedingly preposterous; but to build a general exhibition-room for new inventions was at once to confer a great benefit on the mechanical world, and to lay out their money with every prospect of a profitable return to themselves. We have scarcely a doubt of the success of the undertaking. The exhibition-room is both large and elegant—*perhaps* the most elegant in the metropolis; it consists of a ground-floor and gallery all round, both well lighted from the top; and occupies an area about 150 feet long and between 30 and 40 broad (judging by the eye). The proprietors announce that they "will receive works of art free of any charge to the inventors, reserving only to themselves the exercise of their own judgment that the works so brought to their notice are suitable to the design of their establishment." They look, of course, to the shillings of the public for a remunerating revenue; and if they will only provide the *shilling's worth* of mechanical amusement—surely no difficult matter in these inventive times—we will answer for their having abundance of visitors.

For the present, the inventions to which Mr. Perkins lays claim form nearly all the exhibition; and considering how the establishment originated with Mr. Perkins' personal friends, this is no more than might have been expected. It will be for the permanent interests, however, of the exhibition, that they occupy the prominent place they now hold no longer than is absolutely necessary. These inventions consist, 1. of Mr. Perkins' steam-gun; 2. his steam paddle-wheel; 3. his mode of engraving bank notes, called siderography; and 4. his (last) patent steam-generator. The steam-gun is fired at intervals against a target, from which the balls fall as flat as wafers; boats are seen moving about in large troughs of water, propelled by Mr. Perkins's paddle-wheels (actuated by clock-work concealed within); specimens of the siderographic plates, and of the notes printed from them, are laying about; and the walls are hung with drawings explanatory of his last patent steam-generator, which may moreover be seen in actual operation in a cellar under ground at the further end of the room. Of the first three inventions we shall here say nothing—their merits, and the merits of Mr. Perkins as *connected with* them, *have been long before the public*; but with respect to that newest effort of Mr. Perkins's genius—his last patent steam-generator—we feel compelled, by a regard for truth and a great hatred of all delusion, to offer a few remarks.

In a pamphlet published by Ridgway, and stated to have been "printed for a committee of Mr. Perkins's friends," which has for its express object to show forth the excellence of this his last invented steam-generator, there are the following passages:—

"Odium as well as praise are the portion of every successful innovator. Doubt and suspicion succeed surprise and admiration on every great improvement; and the discoverer in science has after the first flash of applause to overcome the prejudice, self-interest, and misconception of his opponents, competitors, and critics. Mr. Perkins, *the author of the invention now to be disclosed*, has not been singular in these respects. He was sought after, flattered, and rewarded for a time, until, by an unfortunate connexion, his talents were paralysed, and his fortunes blighted, and in all probability future benefit to the public would by his means have been lost but for the steady constancy of a few friends, who appreciated the estimable qualities of the man and the brilliant talents of the mechanic. It is necessary to say these few words in defence of an individual most unjustly aspersed, when addressing the public on an invention *which is to bear his name*."

It must give every lover of science sincere concern to learn that it has ever happened to a man of such unquestionable ingenuity as Mr. Perkins, to have his "talents paralysed and his prospects blighted"—be the circumstances which brought about the eclipse what they may; but they cannot be real friends of Mr. Perkins, who would seek to repair his fortunes by so deliberate an attempt to mystify the public, as the preceding extract displays. The reader will observe the endeavour which is studiously made to connect the stir which was made about Mr. Perkins' steam discoveries a few years ago with "the invention *now* to be disclosed"—to represent his first success, his subsequent misfortunes, and present prospects, as all parts of one history, turning on one point, and that point the steam-generator now exhibited to the public. In all this, however, there is a sad want of truth. The steam generator, about which Mr. Perkins made so much noise a few years ago, is not his present steam generator, nor any thing like to it. For-

merly Mr. P. was to do every thing by generating steam under pressure; now, every thing is to be done by a curious mode of causing the heated particles to circulate. Whatever "odium" or "praise" may have fallen in times bye-gone to the lot of Mr. Perkins, it had no connection whatever with Mr. Perkins as "the author of the invention now to be disclosed." All his past adventures had reference to an invention which Mr. P. has himself now abandoned for another; and to which, therefore, it would seem no great injustice can have been done by the neglect into which it has fallen. In one and the same breath, he complains of being deserted by the world, and justifies the world for deserting him. According to his own admission, he was "rewarded for a time;" and ought not that to be sufficient, for what only lasted "for a time?"

Besides; this new invention of Mr. Perkins's—so pompously introduced to public notice by his "Committee of Friends"—and "which is to bear his name" through all time, is really no invention at all. The grounds on which we affirm this have been already placed before our readers in our 457th and 458th Nos., and need not be here repeated. We challenge Mr. Perkins and his committee to show the slightest difference in principle, between his new steam generator and the steam tea-kettle described in this work as far back as the 8th of March, 1830.

Neither are we satisfied that this new mode of generating steam will be productive of those immense advantages which Mr. P. claims for it. In the pamphlet of his Committee, the saving to be effected by applying it on board of steam-vessels is thus estimated:—

"A saving in	Vessels of	-	3 out of	9
"	Tonnage	-	900 -	2700
"	Horse-power	-	300 -	900
"	First cost	£36,000	-	90,000
"	Annual cost	£16,800	-	36,000."

But this is all mere pen-and-ink work, than which nothing is easier; or, generally speaking, more delusive. A boiler has yet to be seen in actual work; that is, doing something more than steaming the lookers-on; and there is also wanted a faithful report by disinterested witnesses of its performance for some considerable space of time. As matters are, *we have nothing more* than Mr. Perkins's *word for the virtues* of his new boiler; and considering how much all inventors are given to deceive themselves (none more so than Mr. Perkins) this cannot be expected to rank for much with the public. It has not been even yet proved to us by experiment, that Mr. P. is right in that theory of circulation by which he professes to have been guided in the construction of this boiler. We agree with our intelligent correspondent Trebor Valentine (p. 103) in thinking that it involves something very like an impossibility; and when we saw the boiler at work the other day, we thought we perceived evident signs that the course of the heated particles is *not* as Mr. P. supposes—namely, up the sides alone; but, as usual, up—up, wherever there was no obstacle to their progress.

Besides Mr. Perkins's contributions to the exhibition-room, there is a model of a boat with a revolving rudder, invented by A. H. Holdsworth, Esq., M. P. for Dartmouth. This seems a useful invention; and in a future number we shall give a description of it.

To make up for the present lack of new inventions in the room, there is exhibited a very interesting collection of Fossil Organic Remains. The proprietors state that they are "of the most unrivalled character;" and we willingly bear testimony that they are of themselves well worth a visit to the room.

Bow-strings.—It has long been thought that Italian or Flemish hemp makes the best strings. The Italian hemp is stronger in texture and has longer threads than any other. The strings are made of the largest threads, twisted tightly, and secured with a sort of water-glue to guard them against the effects of wet. The eye, or that part of the string which occupies the upper horn of the bow, is made with the string, and is much thicker than the other part. A thick string has an advantage over a thin one in the greater certainty of shot, but a thin one casts farther. —*Hasting's British Archer.*

INTERIM NOTICES.

All Advertisements for the Covers of the Monthly Parts are requested to be sent to the Office before the 25th of each Month.

Communications received from Civis—Trebor Valentine—Kinclaven—Sussexiensis—D. R. A.—M. M. —Equis.

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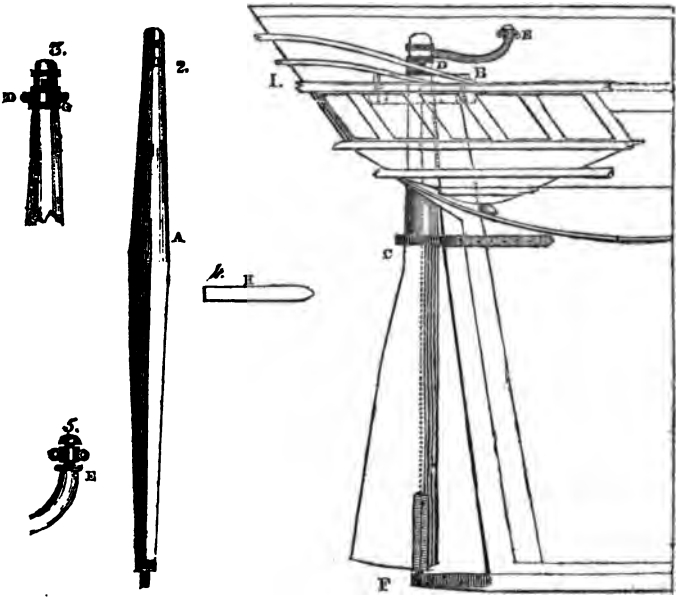
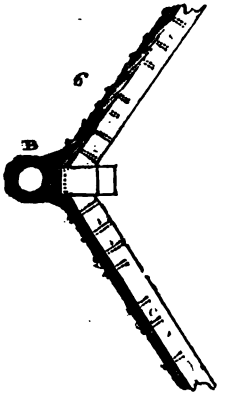
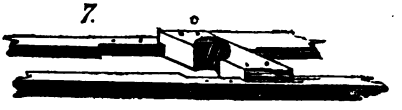
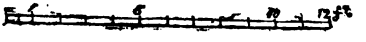
MR. HOLDSWORTH'S REVOLVING RUDDER.









MR. HOLDSWORTH'S REVOLVING-RUDDER.

The engravings on the preceding page represent the revolving-rudder of Mr. Holdsworth, M. P., of which we made mention last week in our notice of the Exhibition of Works of Practical Science. Those who are acquainted with the rudder in common use are aware that it can only be made available when a ship is moving by the head; its action being confined by its shape and mode of hanging to an angle on either side of the post of about 35 degrees. The revolving-rudder, on the contrary, can make an entire revolution on its axis, and is therefore as manageable when the ship makes sternway as when she is moving in her ordinary course. The figure A represents the rudder with its front or bearded edge towards the spectator. That portion of the main piece which is above the hancing is made perfectly round, and works through two collars, B and C. The collar B is fitted into partners on the upper deck, secured by bolts with nuts and screws to the beams. The lower one, C, is fixed to the stern-frame. Those parts of the rudder which work within the collars are hooped with metal, to save the wood and diminish the friction. Two rings, or washers, (G) are placed on the upper collar, and a fid, or pin, (D) is passed through the rudder immediately above them, which fid, or pin, working on the rings or washers, suspends the rudder in its place. The keel of the vessel is allowed to extend sufficiently beyond the stern-post to take on a brace or gudgeon (F) at its end, in which a pintle works, that is, fixed perpendicularly on the axis of the rudder.* The rudder has a tiller turned up at the end, with a swivel upon it (E), to which swivel the tiller-ropes are attached, enabling them to work true when the rudder revolves. It may also be governed by a cogged wheel fixed upon its head, working into a pinion on an upright shaft, as in common use, or by any other apparatus which will enable it to make an entire revolution on its axis. H is a section of the rudder at its foot.

The advantages of this rudder—especially when applied to steam-vessels—are very ably pointed out in an explanatory pamphlet by Mr. Holdsworth. We extract two or three striking passages:—

"To steam-boats, which have as ready a power of propulsion by the stern as by the head, but from the use of which power those who navigate them are debarred, by the imperfect and destructive form of the present rudder, this improvement will be of vast importance; whether the power of reversing the vessel's course be required at sea, or whether in narrow and confined harbours, where the means of moving in either direction will be a peculiar convenience. By this construction of the rudder, steam-vessels intended for war purposes will become doubly useful, particularly when attending a fleet at sea; as they may move from ship to ship, either to one out of the line, or from a place of danger upon a lee-shore, or to speak to another which is astern, without the necessity of turning—an operation which, from the length of the steam-vessel, and particularly when on a lee-shore, or in the midst of other ships upon the wing, is attended with inconvenience, and frequently with great danger.

"To a steam-vessel armed as a gun-boat, this rudder will afford the power of keeping directly to windward, with the head always to the enemy. Such vessel, properly constructed, may alter her position and retreat against the wind and sea, with perfect safety to the rudder, and without exposing it or her broadside to the fire of the ship or fort with which she may be engaged; an advantage which can only be estimated by those who can fully comprehend the details of so important a branch of naval warfare as steam-vessels are likely to become.

"Another disadvantage connected with the navigation of the present steam-vessels, cannot have escaped observation—the space which they require for turning when their course is to be reversed.

"Take, as an example, the situation in which one of these vessels would be placed in a fleet, either attending on men of war, or as a convoy-vessel to merchant-ships. Suppose the fleet running before the wind, and going six or eight knots, and that the steamer had occasion, when surrounded by vessels, to get into the rear of the fleet—to reverse her engines would subject her to the loss of her rudder from the first sea that struck it, whilst to wind under such circumstances could only be effected with great danger to herself and to those vessels whose course she would thwart: a remedy therefore for these difficulties is most desira-

* This mode of attaching the foot of the rudder to the keel is stated by Mr. Holdsworth to have been already some time in use in this country. "Indeed, an eminent builder of the present day prefers hanging the rudders on some of his steam-boats by a pintle on the keel, and a single collar only on the deck, by which means his rudder turns very freely, and works *entirely independent of the stern-post.*

ble. It is well known to seamen, that, in proportion as the length of a vessel is increased (particularly when understood as the length when compared with the breadth), that the space necessary for winding is proportionably enlarged. This difficulty in sailing-vessels is, to a certain extent, counteracted by the skill of the commander, in so managing his sails as to assist the rudder, and thus give more rapid effect to its operation. The commander of the steam-boat is deprived of this advantage, as the power by which the latter is moved is always operating equally on both sides of the vessel, and in a direction parallel to the keel—a circumstance which renders the loss of her rudder of far greater moment than that of any other vessel, as she is deprived of the only means by which she can be guided. There are indeed persons who, taking (as it is presumed) a superficial view of the subject, propose to disconnect the two wheels, and to use them separately as the oars of a boat, when, an engine being appropriated distinctly to each, they may be moved in opposite directions; and thus the turning of the vessel may, as they believe, be greatly facilitated. It would be foreign to the present subject to go into detail on the mechanical objections to this plan for steam-vessels fitted in the usual way; engineers who are employed in this branch of art will adduce ample objections to its accomplishment. Such reference, however, is unnecessary; as the length of these vessels, when compared with the short distance between the wheels, must present an insuperable barrier to any great improvement being anticipated from such a change in the motion of the wheels, if it could be accomplished with safety to the machinery, and if the power of the engines could be preserved; unless a mode can be found of reversing the operation of the lever, and the shorter can be made the more powerful of its arms; of the truth of which, the difficulty of turning a long boat, even when backing water with oars half the length of her body, will afford ample proof to the seaman who will fairly apply his judgment to the subject.

"For barges navigating rivers and canals, it offers as extensive an improvement; as it will enable those vessels with safety to enter narrow channels, from which they would be excluded if unable to come out without turning round. It is well known to those who are acquainted with the general principles of navigation, that the longer the vessel can be made for inland purposes, the better, as she may carry a large cargo, although narrow and of light draft *of water. This* rudder, therefore, will afford the means of trading with larger vessels in shallow water and confined branches of rivers, where very small boats alone, of ordinary construction, have hitherto been enabled to float."

Mr. Holdsworth's pamphlet contains also a number of valuable practical remarks on the different modifications of which the revolving-rudder is susceptible, and on various subordinate matters of construction, connected with the steering of vessels. The production does altogether great credit to Mr. H.'s attainments as an amateur mechanic, and will require to be consulted by every shipbuilder who may think of availing himself of Mr. H.'s important though very simple improvement.

HOME AND FOREIGN TIMBER.

The Highland Society of Scotland have published, in the last Number of their Prize Essays and Transactions, a very valuable communication by Mr. Robert Monteith, the King's Forester for Scotland, "On the Culture and Utility of several kinds of Home-grown Timber which might be used in House-building, in preference to Foreign Timber." Mr. Monteith has in a previous publication advocated the propriety of using larch and other firs in house-building; in the present he points out all the remaining varieties of wood which may be used with equal or greater advantage, as oak, ash, elm, beech, lime, poplar, Spanish chestnut, &c. His remarks on the qualities and prices of these woods contain information of so much importance to all practical mechanics, that we shall lay them with but little abridgment before our readers:—

"It is a well-known fact, that oak, ash, elm, beech, and Spanish chestnut, when employed for any kind of house-work, last for centuries. In some of the oldest houses and castles, of which portions are yet standing, we find joists, floors, couples, &c. entire, although many hundred years old. Witness Castle Campbell, the old castle in Lochaw, Torwood Old House, and many others that could be mentioned, erected above 500 years ago. I have a joiner's plane made from an earth couple, taken from a low farm-house, built in 1601, and which may yet last 100 years. I have often seen these earth-couples, taken from old houses, made into wheel-spokes and fillies. They were usually placed on the ground, and

built into the wall, so that this portion of them had less chance of lasting than the other, which rose above the wall. Many are still to be seen entire in Argyllshire, in houses, the dates of which cannot be ascertained. No foreign timber can bear the least comparison with these couples of oak, ash, and beech; and, in fact, it is admitted by all that home-grown timber lasts four times as long as any of the foreign kinds usually employed.

"We have next to inquire, To what purposes in house-building can these kinds of home-grown timber be most profitably applied? Oak, in former times, was employed for all the purposes in house-building; but, at present, it may be most profitably used for windows, doors, and flooring. It would answer equally for roofing and joisting; but for these uses some of the less valuable kinds are sufficient. Spanish chestnut may be applied to the same purposes as oak; ash and elm are most suitable for joisting and roofing; beech for joisting, flooring, and stairs; lime and poplar for window-shutters, inside doors, serking, and finishing of all kinds.

"That these kinds of timber will answer for the purposes mentioned, none will attempt to deny; but it is difficult to persuade tradesmen to work them. Four principal objections are urged by them against the use or working of these words; 1st. The expense of sawing; 2nd. The difficulty of working; 3rd. The inferior look of British wood in inside finishing; and 4th. The greater labour and expense.

"1. Foreign fir-wood is sawn from the log into scantlings or deals, at 2*s.* 6*d.* per hundred, superficial feet; and the different kinds of timber, commonly called hard-wood, are sawn from the log into scantlings or deals, at from 4*s.* 6*d.* to 5*s.* per hundred feet, both by manual labour. The difference, however, may be reduced, and the objection to which it gives rise completely obviated, by circular saws, which no proprietor of woods should want on his estate, and by which, sawing of all kinds of timber, and into all sizes, is reduced to a mere trifle.

"Suppose joisting, roofing, and serking, which are used off the saw, to be prepared by machinery, say by circular saws; they are managed more accurately in this manner, and require nothing but putting together or nailing down, so that, in this matter, there is rather a saving of workmanship. The remark applies equally to flooring, which, of foreign timber, is generally made from *what is called* battens. These are, for *the most part*, sawn out before they are imported, but they are often very unevenly sawn, so that there is considerable waste in straightening them. Circular saws would completely obviate this, as they cut so exactly as to render very little planing or joining necessary. Besides, flooring-deals or battens are now almost all wrought by machinery, so that the tradesman has merely to lay them down.

"3. British hard-wood, it is said, does not make so fine a job in inside finishing, by which are meant doors, window-shutters, and facings or mouldings. Now, in almost all houses, and especially in good houses, these are no sooner finished than they are painted; in which case, if the wood be durable, it is of little consequence how it looks. But lime and poplar, as I have said, are the kinds best adapted for these purposes; and I would ask what kind of timber could make better looking window-shutters and inside doors than lime and white poplar? Nor could any kind of wood whatever make more beautiful facings or mouldings than good clean lime. I am aware that house-carpenters have never been in the habit of working any of it, so that they are ignorant of its nature; but let them once make a trial of it, and their prejudices will vanish. Nor is poplar a whit behind the best fir for doors; and, as it is less apt to warp than lime, it is of course preferable for this purpose.

"It is well known to cabinet-makers that of all the different kinds of wood for the best dressing-room tables, when left of their natural colour, none can equal the lime, it being of a beautiful white, and retaining its natural colour for many years. In window-shutters and finishing, it will look much better without paint, than the best American fir can do with it, and will last ten times longer.

"4. With respect to the last objection, viz. that home-grown timber requires more labour in working it than foreign wood, I have already shown that the latter can be as cheaply applied to joisting, roofing, and flooring, as the former. I grant that, in respect to doors, window-shutters, and facings, the labour is greater; but the difference is very trifling, and the advantage in point of durability very great.

"Let us suppose, that the finishing of one room, 20 feet by 16, with three bound doors, two sets of window-shutters, and facings, with American fir, will cost 2*l.* 15*s.* for journeymen's wages. Now, lime and poplar are nearly as easily wrought as fir; but suppose they cost even a third more, say 18*s.* 4*d.* In

ordinary farm-houses, or cottages, as we have taken a large room, the average of each room will not be more than 10*s.*; and on the whole building of an ordinary farm-steading the whole expense will not exceed 5*l.*

"Now, let us consider the result of all this in an inland county, Roxburghshire, for example, and at Hawick, or in its neighbourhood. The average price of foreign timber, including carriage, is 2*s.* 8*d.* per foot. Now, a proprietor building a good farm-steading and offices, will require at least 4000 feet, which, at 2*s.* 8*d.*, cost 533*l.* 7*s.* 4*d.* In all this country, say from Kelso westwards, there are vast quantities of young woods coming up, and a vast quantity already for sale, on several estates, where I have myself marked off and valued many hundreds of pounds worth. I never went above 2*s.* per foot for oak stripped of the bark (unless in the case of particularly fine trees); 1*s.* 6*d.* for ash; 1*s.* 6*d.* for beech; 9*d.* for Spanish chestnut; 1*s.* 6*d.* for lime; 1*s.* for poplar; the average of which, taking an even sum, is 1*s.* 4*d.* For 4000 feet, this makes 266*s.* 13*s.* 4*d.*, which, subtracted from 533*l.* 7*s.* 4*d.*, leave a balance of 266*l.* 13*s.* 8*d.* What an immense saving on so small a house as that supposed by a proprietor using his own timber! But this is not all. If the building be made with foreign wood, his son perhaps will have to renew it, or at least it will have to be replaced in a period of 100 years; whereas home-grown timber will last for many generations.

"There is another advantage in the circumstance that the most valuable of the timber need not be used for building. Oak, beech, ash, elm, chesnut, lime, and poplar, of from 25 to 40 years' growth, will serve the purposes mentioned, and the produce of natural woods, even at twenty-five years, will do. If the trees are large enough to be split, that is sawn through the middle, for two joists and couple logs, they will answer; but they should never be used with the heart in them, that is as whole trees; and all the bark should be stripped off, and the wood seasoned with lime, as recommended in a recent publication.

"I was lately at Hovingham Hall, in Yorkshire, the seat of William Worsley, Esq., who is building a princely mansion. Being far inland, the foreign wood, carriage included, cost him, the best kind, nearly 3*s.* per foot; while for his fine oak, and other timber, of which he has large quantities, he could only get from 2*l.* 10*s.* to 5*l.* per ton, or about 2*s.* per foot at an average. He was at length advised to employ it instead of foreign timber, and floored with it his two public rooms, one of which is upwards of 46 by 30 feet, the other nearly the same size. When the sun shines on these floors, they present a very beautiful appearance. All the windows, too, are of oak. Beech, when cut into deals two inches thick, makes excellent inside stairs, and lasts as long as most kinds of freestone. In many modern good houses there, oak and other kinds of home wood are used for windows and flooring.

"I have already mentioned the advantage that would result to every wood proprietor, were he to have circular saws, driven by water, where it can be had, not only for the use of the estate, but for the purpose of cutting up wood to be disposed of. Machinery might be advantageously applied to sawing the wood to be sold, as the purchaser could not cut it at so cheap a rate, and the proprietor would be a gainer, as when cut out upon the ground it is much more easily carted to a distance. In inland districts, where the rough wood has to be driven a distance of from 30 to 40 miles, before a market can be got for it, the expense of carriage is often nearly equal to the price of the timber; this is decidedly the case with Scotch fir, which sells at from 9*d.* to 1*s.* per foot at sea-ports, where alone there is a demand for it; so that the carriage for forty miles will be at least 9*d.* per foot. Besides, in building cottages and ordinary houses for tradesmen, &c., the principal expenses are for the joists, roofing, and flooring; all which are chiefly used without any other working than the application of the saw and axe. If this be done on the ground where the timber grows, the expense will be much less than when sawing is done by manual labour; so that all house-builders and proprietors in towns, and everywhere, could be served with home-grown timber at a much cheaper rate; while by using it in preference to more expensive and less durable foreign timber, they would hand over to their heirs a substantial building that might last for centuries, in place of one constructed of American timber, and which may serve the father but not the son."

FIRE ESCAPES—A FEW OBSERVATIONS WORTH THE ATTENTION OF PAROCHIAL VESTRIES.

Sir,—The loss of lives that lately occurred in Oxford-street, from fire, will, I hope, be admitted as an apology for

troubling you with a few remarks, which, if acted on, would prevent the recurrence of such calamities.

An efficient canvass fire-escape, that could be universally and instantaneously used, has been long since invented. The pages of the Mechanics' Magazine bear testimony to its utility; but of the little attention paid to the discovery, the friends of humanity have a just right to complain. In nine cases out of ten it has never been turned to any account; and this, every one who knows the facility with which it could be used, to the salvation of human life, must allow to be without excuse. In twelve years, the average expense of providing the whole metropolis with escapes of this description would not be more than equal to six shillings from each house, or sixpence per annum. The escape, too, would be useful, not only in saving life, but also in saving property. I will not, Sir, trouble you with the calculations on this account; but I will, with your permission, state, how the canvass fire-escape might be universally applied:

First,—I would have all the houses numbered from one to five hundred, having also the street numbers on each door, as at present. Then, in the middle shutter of each twenty-fifth, fiftieth, or hundredth house, I would have an open box, in which this fire-escape should always remain by night; whilst the said escape should always be kept at hand, in the shop, by day.

Secondly,—In order that these escapes might be instantly used, in all cases, I would have them all of one size, say from twelve to fifteen feet long, by from seven to eight in breadth. On one side I would have about four short chains, from twelve to eighteen inches long, at equal distances and similar divisions. In front of the houses, at convenient heights, say three feet, I would have hooks, to which these chains could be instantly attached. Then any two men, or even women, could immediately affix the escape to the house on fire; and, by holding on the outer corners (to which I would affix hand-holds or grummets), the fall of the heaviest individual, jumping from the top of the highest house, would be broken, and life preserved.

On each of these escapes the name of the street and number of the house, to which it belonged, should be painted. To prevent their being stolen, the canvass, to be used, could be wove with some peculiar colour, differing from the common, at two, four, six, or eight inches, or it could be chequered in the loom.

If a reward should, at any time, be necessary to induce men to use this escape, a trifle, say five shillings, for each life preserved, would be sufficient. But, I cannot think so ill of men, as to suppose they would want any stimulus on such occasions. Your insertion of this will probably meet the approbation of all humane characters.

I am, Sir, yours, &c.

MICHAEL ROUGH, Schoolmaster.

21, Little Earl-street, Seven Dials, London.
June 9, 1832.

AMERICAN STATISTICS.

Sir,—T asserts, page 77, that "No individual has ever received, from the United States, either half-pay or pension. Public services, both civil and military, are rewarded by grants of land." In answer to this, I assert, that considerable sums are yearly paid, as pensions in the United States, and as rewards for public services. I have now before me the accounts of the expenditure for thirteen years; and in every year large sums appear under the head of pensions, which amounted, in 1827, the last of these years, to 976,000 dollars, by far the greater part of which are revolutionary pensions. In some years the pensions have exceeded three millions of dollars; this was the case in 1820. T. goes on to assert, that, "in 1815, the war establishments of the United States were disbanded." The fact is, they were increased one-seventh the very next year. It is true, they have been since diminished; but still the expense for the latest return, viz. 1827, was but a little under 4,000,000 of dollars. His next assertion is stranger still. "In the following years 1816-17-18, the English war establishments were disbanded, to be a dead-weight upon the national industry." Is there any Englishman so ignorant as not to know that our army exceeds a hundred thousand men? The exact number, for this year, is 109,000 men, the expense of which exceeds three millions and a half, besides the "dead weight of 2,734,952*l.*

Such are our "disbanded" war establishments, without including the navy!

I am, Sir, yours, &c.

CIVIS.

NOTE ON THE BRITISH ASSOCIATION FOR THE PROMOTION OF SCIENCE, AND OTHER MIGRATORY SCIENTIFIC MEETINGS. BY GEORGE HARVEY, ESQ. F.R.S.S.L. AND E.

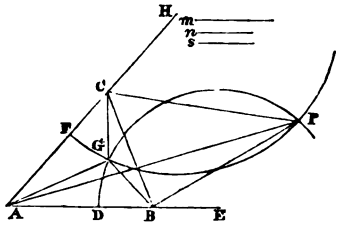
In all that has been written respecting the migratory scientific meetings that have, in later years, taken place on the Continent, or the great meeting lately held, for the same purposes, at York, I do not remember any allusion having been made to the circumstance that those meetings fulfil, in a very remarkable manner, one of the splendid predictions of Bacon. As the fixed and stationary societies of Europe grew out of his beautiful description of "Solomon's House," so has the irresistible tide of events at length brought about those "circuits or visits of divers principal cities of the kingdom, which he regarded as another distinguishing feature of the new Atlantis," and which it has been reserved for our own day to see so completely fulfilled. In the establishment of these "circuits" it is evident, that the views of Bacon must have been entirely perspective; since societies having fixed and stationary places of meeting, must have first been permitted to exist before any attempt could be made to form associations of a migratory kind. Such stationary meetings have very long existed; but they stand as great insulated points in the hemisphere of knowledge, and are known only to each other by the interchange of their transactions, or the occasional diplomas sent from one to the other. Poisson and Arago at Paris, Berzelius at Stockholm, Gauss at Gottingen, Oersted at Copenhagen, and Encke at Berlin, have long cultivated the sciences, with success, in their respective academies; but a new bond of sympathy was wanting to knit these illustrious men in closer fellowship together. The "circuits" of Bacon's Atlantis will do this; and the "visits" at Berlin and York cannot but infuse fresh vigour into the world of science. Those who live far removed from the intercourse of scientific men, can best estimate the advantages resulting from *personal communion*. Many a solitary and dejected heart has been quickened and revived by oral communications with illustrious men; and we cannot but hope, that, while the fixed academies have in general so abundantly fulfilled the magnificent conceptions of Bacon, these "circuits of divers principal cities" will equally realize all that his prophetic mind anticipated.—*Edinburgh Journal of Science.*

SOLUTION OF THE FOURTH MATHEMATICAL QUESTION, VOL. XVI., P. 106.

By a Cambridge Student.

Question.—Three lights of different but given brightness being given in position, it is required to find a point or points from which the three lights will appear equally luminous.

The following solution is partly derived from a principle which is demonstrated by the writers on natural philosophy:—



Let A B and C be the position of the three lights; join A B, A C, B C, and let m, n, and s express the respective ratios of their brightness. Suppose G to be any point whatever; join G A, G B, G C; then the principle of natural philosophy $\frac{m}{AG^2}$, $\frac{n}{BG^2}$, $\frac{s}{GC^2}$ will express the ratio of their brightness, as seen from the point G. Then, if $\frac{m}{AG^2} = \frac{n}{BG^2} = \frac{s}{GC^2}$; and consequently $AG^2 : BG^2 :: m : n$, and $AG^2 : GC^2 :: m : P$; also $BG^2 : GC^2 :: n : s$, the three lights will appear equally luminous to an eye placed at the point G.

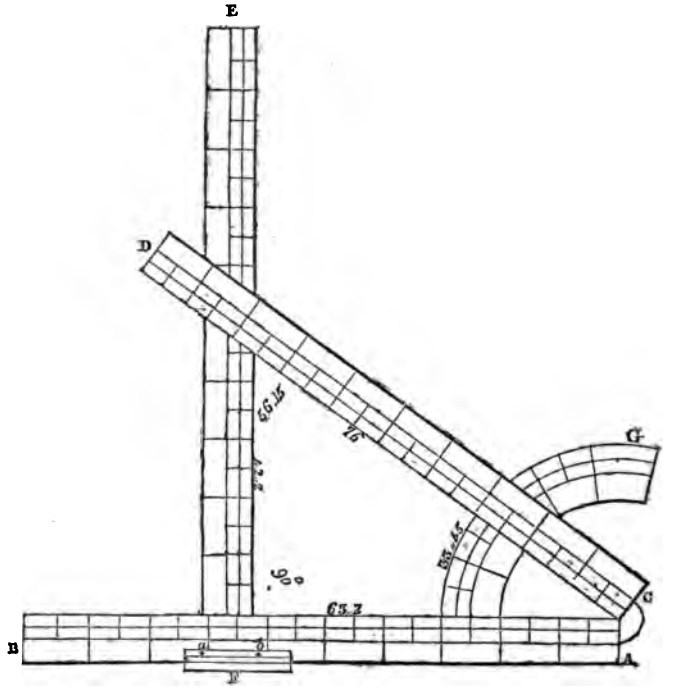
Construction.—Divide A B and A C in D and F; so that $AD^2 : DB^2 :: m : n$, and $AF^2 : FC^2 :: m : s$; produce A B, A C to the points E and H— so that $AE \cdot EB = DE^2$, and $AH \cdot HC =$

FH^2; and from the centres E and H and radii E D, H F describe two circles intersecting one another in the points G and P; then shall G and P be the points required. Join A G, B G, C G, A P, B P, C P; because $AE \cdot EB = DE^2$ ∴ (Prop. F, Book 6, Playfair's Geometry) A D : D B :: A G : B G, or $AG^2 : BG^2 :: AD^2 : DD^2 :: m : n$; for the same reason, $AG^2 : GC^2 :: m : s$; consequently, by equality, $BG^2 : CG^2 :: n : s$; also, $AP^2 : BP^2 :: m : n$, and $AP^2 : CP^2 :: m : s$; hence $BP^2 : CP^2 :: n : s$.

Cor.—If the circles only touch one another, the problem admits of only one solution; if they neither cut nor touch one another, the problem is then impossible.

Cambridge, March 25, 1832.

SEAMEN'S OCTANTS.



Sir,—In the description given in the Mechanics' Magazine, No. 254, of Crow's Seaman's Octant, it is represented as being something quite new. Now, sir, I beg leave to inform you, that not only something of the kind, but, in my opinion, the very thing itself, was invented by me near seven years ago. It is not uncommon for different persons to invent the same thing. I do not, therefore, accuse Mr. Crow of plagiarism; but I consider that, if I am not entitled to the *merit of the invention* exclusively, I *have at least an undoubted* claim to the honour (such as it may be) of having preceded Mr. Crow.

That I do not advance this claim on insufficient grounds, you will be fully satisfied on referring to the London Mechanics' Register, for Saturday, 26th November, 1825, where you will find an engraving and description of the analogous instrument invented by me; and which you will, perhaps, do me the favour to transfer to the pages of your work. The only difference I can perceive between Mr. Crow's instrument and mine is, that Mr. C. has carried the arch to the ex-

tremity of the leg AB. This I readily allow to be an improvement.

I remain, Sir, yours, &c.

THOMAS HEATH.

8, Pedley-street, Bethnal-green.
21st May, 1832.

The following is the article referred to by Mr. Heath:—

"Some years ago an idea suggested itself to me, of an instrument to measure the angles and sides of right-angled triangles in trigonometry, which, I found to be so simple, that I considered something of the kind was certainly to be met with. But being a poor man, and not able to go to the expense, I thought no more about it; but seeing, recently, several plans of something similar, though, in my opinion, much too complicated for a young beginner in navigation, &c., I take the liberty of offering mine (if you think it worth accepting) to the consideration of some of your learned correspondents. Its construction needs little explanation.

The legs AB and CD are each made of two pieces, firmly rivetted at each end, with a space left between each to admit the leg EF to slide freely backwards and forwards. G is a graduated arch, which need not exceed fifty or sixty degrees, firmly fixed in the leg AB, but traversing through CD; E is a piece of brass made to slide on the lower edge of the leg AB, and through which EF is rivetted. *a* and *b* are two screws which slide along a groove in AB with EF, and which serves to keep it in a perpendicular direction, as well as to fix it when at its intended distance. There is a similar screw in CD to fix it to the graduated arch; the instrument never need be opened wider than 45 degrees. Should a larger angle be required, by taking the complement and inversing the sides, any course, distance, difference of latitude, or departure, may be accurately measured.

T. H——H.

ON THE NATURE AND PROPERTIES OF LIGHT, AND ON COMETS.

Sir,—The following reasoning is offered to the public, through your magazine, not certainly as uncontrovertable, because it is in direct contradiction to the theory that has been long promulgated; but to elicit, if possible, an explanation of certain phenomena, more consistent with *reason, than the old theory.*

All lecturers upon the subject of light assert, that it passes in rays, and is eight minutes in travelling from the sun to our earth; but I have never been able to discover how this is ascertained to be the case. Light may be, and indeed is refracted; but as an effect, it can never cease. The degree of light, at any time, surrounding us, is increased or diminished from many causes; for example, the state of our atmosphere, interception, total or partial, &c. Light, too, is capable of being produced by various means, as well as that which may be termed its natural source, or the sun. I submit, that it cannot, therefore, be considered an elementary principle; nor constitute, as Dr. Brewster supposes, a part of either the mineral or vegetable kingdoms. One very singular effect of light is, that without it, all vegetable productions would be white; whereas scarcely any colour, made by art, can resist the well-known effect of light—being, according to its intensity, more or less bleached, or deprived of their original appearance. This is particularly true, when the basis is of a vegetable nature. Even white itself may be rendered more white. If light passes, or is transmitted in rays, how is it that we do not see the full effect eight minutes after the sun's obscuration—which change often occurs at particular seasons? Certainly, if the sun is a body of matter on fire, its natural effect, light, must be constant and uniform; although, from the earth's revolving, and other causes, the light may be intercepted, partially or totally. I cannot help thinking, that, if light passed in rays, the Georgium Sidus would have the benefit of as great a degree of light as our earth: because light would flow to the end of space, without like water, evaporating as it proceeded. The only argument I know of against such reasoning, consists in the usual observation, that the rays of light may be collected in a focus with a lens; but this common remark I also think is incorrect. Imagine such effect to be produced only by the sun when vertical, or nearly so; for, during the winter months, little or no effect of the kind is produced. It cannot, therefore, be light, but heat transmitted immediately from the sun, and received on a glass, each side being focal; for no other form can collect such effect. I conceive that light, not being material, or capable of analyzation (for

then we should discover its constituent parts), cannot possibly constitute a part of metals, either as a basis or secondary principle, as Dr. Brewster has asserted. Combustion appears to be a combination of oxygen with an inflammable matter, which is possessed by almost all known substances. The combustion of camphor, nitrate of potash, and phosphorus, gives a beautiful white flame—that of sulphur is blue; all this is merely owing to varieties of combination, for such appearances may be altered by conflagrating them under different circumstances, on heated iron, in vacuo, &c. The intensity of inflammation depends on the inflammability of matter; and the more rapid the combustion, the more intense must be the heat and light. But flame is capable of assuming colour only, not light; because, setting aside reflection, if we turn our backs to ignited sulphur, spirit of wine, or nitrate of potash, we cannot tell the colour of the inflammation, although the light may be ardent. The principle of heat or caloric can be obtained mechanically or chemically, by friction or combination; and although it is a powerful agent, it certainly is not a first principle. We may safely say, heat and light are perfectly independent of each other for their origin; although with heat light takes place, yet heat is not always coincident with light; and yet both are caused by, and in fact cannot take place without, combustion. The sun must be, therefore, matter, kept by some unknown principle in a constant state of combustion, without being inthe least degree consumed.

A word or two now on comets. Many have been the conjectures respecting comets,—some of them strange enough. It is by no means a new idea that our earth will ultimately be destroyed by a comet. Some have taken up this notion because they think the use of comets cannot be otherwise accounted for; and others, because we are taught, by the Scriptures, to believe the earth will be destroyed by fire.

But I think it can be shown that such an unfavourable meeting cannot possibly take place. Comets and the sun must be masses on fire, certainly not masses of fire; and although we must conclude such masses to be matter, time, I should think, will never develope what their *constituent principles* are, whether opaque or not. The most rational supposition seems to be, that the whole of our planetary system (in which I include comets) originated together, and that the comets were designed to afford heat and light to the extreme planets; for both light and heat deteriorate in power, in proportion to their distance from their source; indeed comets do not appear to have any other possible utility. We know that comets as well as planets must always pursue the exact course, or order of nature, they had from the beginning; for the least deviation of either one or the other, would sooner or later end in the subversion of the whole system. Mr. Baddeley's observation, page 117, vol. 17, that "we are not warranted in the conclusion, that a comet 160 millions of miles in diameter, cannot be seen when in the presence of the sun's rays," must be incorrect, because it makes the comet's diameter more than five times that of the sun. I am disposed to assign to comets a degree of importance only next to that of the sun in our system. I imagine their heat and light to be original properties with them, and perfectly independent of the sun; a supposition which would account for their brilliancy being always the same, although modified perhaps by changes of place, and (to us) by our atmosphere. The brilliancy of a comet must consequently increase as it approaches our observation, and its tail decrease. If comets present in every position, as they are found to do, the same luminous appearance—this alone, independent of their near approach to the sun, forbids the idea of their being inhabited. The tail is observed as soon as the comet, and is caused by a refraction of vivid light upon the atmosphere surrounding it, which atmosphere is rendered conical by resistance, and by the impetus of the comet. I ascertained, by fixing a string round a piece of sponge dipped in spirits of wine, and set on fire, that if made to describe a circle, the resistance of the air caused the inflamed sponge to leave as it passed a sort of tail, not certainly defined by straight lines, but from the nature of the combustion, with a sparkling or brush-like appearance. Comets then must be a mass of matter like the sun, in a perfect state of combustion, always pursuing one undeviating course.

They are what I should term, consistently, travelling suns, which supply heat and light to the remoter planets in our system (many, doubtless, yet unknown.) This idea is rendered still more probable from the certain, yet astonishingly different periods of the revolution of comets, and their peculiar yet unerring tracks. It is also remarkable, that the greater the line described by these luminaries, so in proportion is their power of heat and light observed. The comet of 1680, calculated by Sir Isaac Newton, confirms this hypothesis.

I am, Sir,
Yours, &c.
G. L. S.

Enfield, June 6, 1832.

PARLIAMENTARY REPRESENTATION.

Sir,—I beg leave to mention to your correspondent of the University of Cambridge (No. 460) that England is entitled to a small majority of representatives for population; and to a large—a very large—majority of representatives for taxes.

The English population being .	13,894,000
The Irish and Scotch . . .	10,099,000
And the English taxes being .	£43,258,990
The Irish and Scotch . . .	£ 9,505,454

It is then visible to the almost blind, that upon the joint principle of population and taxes, it would be a monstrous act of not only injustice, but stupidity, were "one half of the whole members to be returned to Parliament on the basis of population, and the other half for taxes."

It was an every-day remark of M. Voltaire, that *a-propos* was the best word in the dictionary. The formula enacted on the 7th of June, 1832, is published in the Mechanics' Magazine.

$$\left.\begin{matrix}13{,}894{,}000 \text{ Population} \\ + \\ 43{,}258{,}990 \text{ Taxes}\end{matrix}\right\} \text{England} : 500 :: \left.\begin{matrix}7{,}734{,}000 \\ \\ 4{,}392{,}101\end{matrix}\right\} := 106 \text{ Ireland.}$$

$$\left.\begin{matrix}\text{England } 513 - 13 \\ \text{Ireland } 100 + 6 \\ \text{Scotland } 45 + 20\end{matrix}\right\} \quad \left.\begin{matrix}2{,}365{,}000 \\ 5{,}113{,}353\end{matrix}\right\} := 65 \text{ Scotland.}$$

Should there be no addition to the representation, Ireland will be minus only 1 and Scotland 12.

Then $158 + 500 = 658.$
Mr. Drummond gives $197\frac{1}{2} + 460\frac{1}{2} = 658.$

However, this is no "mathematical authority for the repeal of the Union."

It is admitted that Scotland is entitled to 65 representatives; because:—

$$\frac{52{,}764{,}444}{23{,}993{,}000} = 2{\cdot}199$$

Or,
$$\frac{5{,}113{,}353}{2{,}365{,}000} = 2{\cdot}162$$

is the average individual tax levied by the House of Commons. Is it not surprising how very near the Scotch wind the Chancellor of the Exchequer? But then, it is a very *gauche* compliment to the industry of Scotland to assert, that one-half of her representatives should be returned for population. For,

$$\frac{52{,}764{,}444}{5{,}113{,}353} = 13{\cdot}189 \text{ taxes.}$$

$$\frac{23{,}993{,}000}{2{,}365{,}000} = 10{\cdot}145 \text{ population.}$$

I shall re-assert that no injustice has been done to Ireland by the Reform Bill. Quite the contrary; every good-hearted man throughout the United Kingdom has his hands raised to Heaven praying for the eternal happiness of Earl Grey. If Ireland will have more representatives, she must pay more taxes. Now, Sir, as this is a season of good humour, will you permit me to ask your correspondent (the gentleman who pulled off his coat and waistcoat to give me a drubbing) what we are to do with his algebraic symbols—the 658 *imaginary* representatives? Shall we inter them in the new cemetery on the Harrow-road? Or, shall we hand them over to Mr. Theodore Hook, for an additional act to the farce of Killing no Murder? Concerning the 29 and 3 quarters of another Honourable Gentleman which have tripped over to Ireland to prove that though halved and quartered "a man's a man for a' that," we are left to suppose that the gentleman who has 3 of his quarters in Ireland, is your correspondent's acquaintance, Mr. John Wilson Croker. If this be really the fact, with how much *sensibilité* will the news be received at the John Bull office, that having accounted by mathematical demonstration for the ubiquity of Sir Boyle Roche's bird—*ergo*, 3 of Mr. Croker's quarters may be returned with Dr. Lefroy to the Reformed Parliament for the Irish University, while the head quarter of the Right Honourable Gentleman shall represent the Corporation of Cocker's-mouth!

I have the honour to be,
Sir,
Your obedient servant,
T.

I receive, with thanks, the advice your Cambridge Correspondent has been pleased to give me, and shall act upon it. The time is come for financial Reform.

THE CASE IN VALUATION.

VOL. XVII., P. 80.

"*Case.*—The value of an estate let at £900 per annum, held by lease for 21 years from Lady Day 1827, subject to the payment of ground rent, land tax, and other (out) goings, amounting to £50 per annum; and also to a gift of £100 every seventh year, towards the support of an hospital. The rate of interest agreed upon is 8 per cent. The lease is granted by a college, and is renewable every seventh year upon payment of a fine. The last fine paid was £1000."

Sir,—In compliance with the request of your correspondent Mr. Repry, I have made the necessary calculations, in order to ascertain the value of the estate above referred to, for insertion in your valuable Magazine.

The yearly rent being £900, and the outgoings £50, the actual sum received annually by the lessee is £850.

The first question we have to solve is, What would the sums of each year's rent amount to, in the unexpired term from Lady Day 1832, at compound interest at 4 per cent? I have stated the interest at 4 per cent., because that is about the rate of interest that would be obtained, supposing the rent to be put out to interest when received every year. *In order to solve this* problem, I have calculated the following table, containing the compound interest of £1 at 4 per cent., in whole numbers and decimals, for 15 successive years. I have only made the calculations for 15 years, because as the rent would not be received till the end of the first year, there would be but 15 years from that time to the expiration of the lease.

15th year	1·80094
14	1·73168
13	1·66507
12	1·60103
11	1.53945
10	1.48024
9	1·42331
8	1·36857
7	1·31593
6	1·26532
5	1·21665
4	1·16986
3	1·12486
2	1·08160
1	1·04000
0	1·00000
	21·82451

The sum of all the numbers in this table is 21·82451, which multiplied by 850, the rent, gives 18550·8335 for the answer in pounds and decimals, or the sum to which the rent would accumulate

if it were put out at compound interest, at 4 per cent. every year when received.

The next question to be solved is—to what sum would the various payments made by the lessee (viz. the £1000 at the *beginning* of every 7 years, and the £100 gift to the hospital at the *end* of every 7 years) amount at compound interest at 4 per cent., in the unexpired term of the lease?

Now, the purchaser of the lease would have nothing to pay except the purchase money for two years, from Lady Day 1832. He would then have to pay the £100 to the hospital, and the £1000 fine; the compound interest of which two sums for 7 years, at 4 per cent. per annum, amounts to 1447·523, and if we now add to this sum the £100 gift; and the £1000 fine, and calculate the compound interest for the next seven years as above, the result will be 3352·36194, to which add the £100 gift, and the answer is 3452·3194; or the sum in pounds and decimals to which the various payments made by the lessee would amount, at compound interest, at 4 per cent. during the unexpired term of the lease from Lady Day last. Deduct this sum from 18550·8335, and the remainder 15098·47156 is the net produce of the estate in pounds and decimals for the 16 years from Lady Day, 1832.

We have now to ascertain what sum the purchaser ought to give for the lease, so that, at its expiration, he may have received back his purchase money, together with 8 per cent. per annum interest; and as in estimating the produce of the estate we have supposed the rent has been allowed to accumulate till the end of the term, at compound interest at 4 per cent. per annum, so we must now take into account the compound interest at the same rate, on the interest of the principle at 8 per cent.

Let the purchase money be represented by P: then, $100:8::P:\frac{8P}{100}$ = the interest on the sum P at 8 per cent. Multiply this by 21·82451, the sum of the numbers in the preceding table, and we shall have $\frac{8P \times 21{\cdot}82451}{100} = 1{\cdot}74596\,P$, for the compound interest at 4 per cent. of the interest of the principle at 8 per cent.

Hence, $P + 1{\cdot}74596\,P = 15098{\cdot}47156$,

and $P = \frac{15098{\cdot}47156}{2{\cdot}174596} = 5498{\cdot}43 =$ £5498 8*s.* 8*d.*, the value of the lease.

Those who do not understand the algebraic process here adopted, may verify the result by calculating the simple interest on £5498 8*s.* 8*d.*, which is £439 17*s.* 6*d.*, and then calculate the compound interest of this sum for every year of the term, by multiplying it by the sum of the numbers in the table, and the product will be 9600 04, which, added to 5498·43, the sum is 15098·47 = the net produce of the estate.

I am, Sir, yours, &c.

WILLIAM LAKE, Surveyor, &c.

Tring, June 5, 1832.

ARE RAILWAYS A NUISANCE?

At the Lancaster Spring Assizes, 1831, the Stockton and Darlington Railway Company were indicted for a nuisance, on the ground that the steam carriages used on that railway caused alarm and danger to horses on the adjacent highway. The fact of such alarm being caused was admitted, and a special verdict taken to that effect; but the case stood over for argument at Westminster on a point raised by the defendants, namely, that the Act of Parliament by which they are incorporated authorises them to use such engines, and that they are therefore protected against all necessary consequences. (See Mech. Mag., vol. xv, p. 88.)

The argument came on this week before the Court of King's Bench, when:—

Mr. Pollock for the company, made a very able speech in behalf of the Company and of steam carriages; contending —1st. that the Act of Parliament gave the Company, in express terms, the power to run steam carriages; and 2nd, that the public advantages attending this mode of conveyance, are such as more than counterbalance the inconvenience established by the special verdict.

Mr. Cresswell answered, that it was too much to say that any Act of Parliament could authorize the bringing of a nuisance to a man's door, and that where an enabling statute went an unwarrantable length, it ought to be restrained by the common law. It might be true that steam conveyance was attended with the advantages alleged, but that would not

justify the defendants for laying down their railway so close to the existing highway. They might have laid down their line at such a distance from it, as to avoid all cause of complaint.

The Court observed, that it did not appear from the special verdict how far the railway was from the public road; nor whether the danger to the horses arose from the noise merely, or from the railways not being fenced in. The question was one of great importance, and these were material points to be ascertained before coming to a decision. The case was therefore directed to be again submitted to a jury, in order that the special verdict may be amended.

MILE-STONE COTTAGES.

Sir,—Your correspondent T. seems to have got completely into *hot water* on the subject of Parliamentary representation: his opponents, Philo-Scott and A Cambridge Student, show but little of the *milk* of human kindness towards him, and apply anything but the *sugared* nothings of flattery to his lucubrations. Unfortunately, in his paper on the subject in question, T. had imprudently condescended to be intelligible, and the consequence has been that his magisterial dicta are disputed and disproved on all hands, and their writer completely sent to *pot*. It was not so with his articles on Commercial Science, which are allowed by every one to pass unimpugned, simply because no one can "make head or tail" of them. If I were to enter the field against them, I should make use of T.'s own weapons, and oppose to his views the considerations—that "the bear popped his head into the barber's shop—what! no soap!—so their grandmother went for the gooseberry-pie, and the Bank of England got to bed sober at last, while the barber shaved the cat, and they all danced to the tune of Drops of Brandy—

$$2 \times 2 = 4$$
$$2 + 2 = 4$$
$$0 \text{ saved to the nation,}$$

while the gunpowder ran out at the heels of their boots." There, I think that argument fits to a T.

Again,—Mr. Davies, of Philpot-lane, must take off his hat to the Herr-Hirsch! And why not? All are alike in the dark! 5 from 7, and 2 remain.

The mile-stone cottage scheme attributed to the same correspondent (although, in fact, it was thought of long before T.) seems to have taken the fancy of many worthy persons, who have forthwith set to work and made divers designs for said cottages,—which look exceedingly well on paper,—without bestowing a thought on the important question, "Where is the money to come from?" No one, I believe, has proposed any scheme for raising the necessary capital, except T., who proposes, if I can rightly perceive his drift through the mist of his eccentricity, that each of our military pensioners shall receive the value of his pension, *will* he *nill* he, in colonial lands, *minus* five pounds, which sum is to go towards making up a capital for the building of milestone cottages. In other words, each pensioner is to be forced to subscribe five pounds towards the scheme! At this rate, capital might be very easily obtained for any purpose whatever by the Government. They have no need to mince the matter—why not dock all the pensions at once? If it is correct in principle to take five pounds from a man, it is equally so to take fifty. The whole proposition is ridiculous; as far as can be seen the very grounds of T.'s reasoning are delusive.

There is another grand defect in this grand scheme—a labourer is to be allowed to reside rent-free in each of these cottages, on condition of keeping his mile of road, house, garden, &c. in perfect order,—in fact, as a model for the neighbourhood,—which will cost him, according to Mr. Loudon, sixty-days' labour in the year. Where, then, is the wonderful advantage to the cottager? As matters stand, there are very few who can afford to pay the price of sixty-days' labour in rent. True, they do not live in villa-like lodges in the Italian style, with a stone terrace (thrown in without making any difference in the estimate*) Gothic sashes, and chimney-pots in the Moorish style: yet their habitations may

* As to estimates, Mr. Loudon's plan of reckoning at per cube-foot is exceedingly handy, but a detailed one would be more likely to come *near* the truth, especially when the nicnackeries Mr. L. would have in his *palazzo* are considered.

be quite as comfortable, and are often infinitely more picturesque and more pleasing, because not out of character, and not "got up" "for effect."

Thus, then, our veterans are to be barefacedly-robbed of five-pounds a-piece, and our labourers made to work harder than before, in order that the Editor of the Gardener's Magazine and a certain Mr. T. (not U. also, I hope, Mr. Editor) may be delighted at the sight of pretty toy-cottages instead of milestones, and puzzled to think why a man should be obliged to toil harder who lives *rent-free*, than another who pays two or three pounds a-year for his house! I am afraid, however, they will yet have to wait some time for this happy consummation.

Trusting these few observations will not be deemed too T-dious for the pages of the Mech. Mag., and that you are not so "partial to T." as to refuse insertion to these remarks on the T-*leaves* contributed to the Mechanics' Magazine by your T-*totum* correspondent,

I remain, Sir,
Your H. R. T. admirer,
KALOPINO.

June 8, 1832.

[Our correspondent is more witty than wise. The means by which it has been proposed to carry the scheme of erecting mile-stone cottages into effect, may not be the most judicious in the world, and yet the scheme itself be, what we think it is, a very excellent one. There is a talk of extending the metropolitan system of police throughout the country; and should this be done, the Act for the purpose might conveniently embrace a provision for the erection of such cottages as places of residence for the guardians of the peace. Something of the kind already exists in the different Horse Patrole stations, on the roads leading from the metropolis. — Ed. M. M.]

FOOT-BRIDGES OVER STREET-CROSSINGS.

Dear Sir,—The crossings of the streets in the great thoroughfares of London, in the winter months, are very dangerous to foot-passengers, owing to their generally muddy and slippery state, and the number of horses, carriages, &c., which are continually driving past. Many arms, legs, and ribs, have been broken, to say nothing of persons who have been killed outright. I beg to suggest, by way of remedy for this, the construction of light foot-bridges across the streets wherever there are inconvenient crossings; for instance, from the west end of Cheapside to the corner of St. Paul's Church-yard, from the foot of Ludgate-hill over Bridge-street and Farringdon-street. They might be fine fancy Gothic iron-bridges, like triumphal arches, or even light wire swing-bridges, high enough for stage-coaches, vans, or waggons to pass under. The steps of these foot-bridges might be of wood; and much taste might be displayed in the designs for hand-rails, &c. They might be covered in, or not, and at night lighted with gas. Such bridges would, in addition to their utility, be an ornament to the City. Transparencies might also be put up on particular occasions, as on victories, birth days, Lord Mayors' days, &c. The sweeper of the crossing might be employed to keep them clean.

I am, Sir, yours, &c.
WILLIAM REED.

Coal Mine Explosions.—Sir, I have seen in you valuable Magazine several letters on the ventilation of mines, but I cannot say that I rightly understand the method which Mr. Ryan has proposed and Humanitas so strongly recommends. As I find there are several others of your readers in the same predicament, I take leave to request that either Mr. Ryan or his friend Humanitas will favour us with a plan of a coal-pit's workings according to Mr. R.'s notions, and explain distinctly and clearly the method he would use to free them from wild-fire. It would be advisable that the workings in the plan should be made to cross two or three faults, as workings sometimes do. The subject would then be brought in a more tangible form before your readers.—Yours, RAREFACTION, Bilston, June 8, 1832.

Explosions of Gunpowder.—A new plan has been lately invented for preventing the dangers which frequently arise from explosions of gunpowder in blasting. Threads of a small texture, attached each to a weight or bag, are drawn through a funnel-shaped apparatus in one part of the manufactory, in a closet; and these threads are twisted round a tube, which is made to emit prepared gunpowder or other inflammable material in certain quantities. The fuze goes through all the well-known process of rope-making, and is then wrapped, as a splice is, by a thread or twine, which is cleverly twisted round it as in some cables. The whole is then covered with pitch or resin, and made waterproof. It may be cut into lengths; and such a train or fuze will effect all that can be done by any other method, and greatly lessen the danger of blasting rocks.—*Cornubian.*

The Aurora Borealis may be a polar twilight in which the sun's primary rays are refracted down closer to us, in consequence of passing over the frozen regions of the poles; and the occasional alterations in the state of the atmosphere (in consequence of changes in the wind and shifting about of icebergs) by refracting the primary rays of the sun's light in a greater or less degree, may perhaps be sufficient to

account for the variety of form and colour, and all the other phenomena that distinguish these lights from the common twilight. Whenever these lights are seen they appear to issue either from the sun or from that part of the horizon that forms very nearly a straight line between the spectator and the sun. In the north of Scotland they are very frequently seen, and generally very vivid; in France and in the south of England they are not often seen, and become much fainter: and *within the tropics*, I believe, they have never been observed. All these facts strengthen my opinion, that the phenomenon consists simply of *secondary* rays that are emitted from the sun's *primary* rays, which as they are passing across the poles are refracted (according to the state of density in the atmosphere), in a greater or less degree towards the earth; and as these primary rays as they are crossing the poles must necessarily pass much closer to those persons who reside in the polar regions, than to those who live nearer the equator, it stands to reason that the phenomenon must become more vivid, in the same proportion as we approach the poles.—*Captain Forman.*

An English Claimant to the Invention of the Telescope.—The celebrated English mathematician, Thomas Harriot, actually observed the satellites of Jupiter as early as the 10th of January, 1610, which is only eleven days later than Galileo's discovery. Harriot also observed the spots in the sun for the first time on the 8th of December, 1610. They were first seen by Galileo in November of the same year. Harriot's telescopes had, it appears, powers of 10, 20, and 30. His observations run from the 16th of January, 1610, to the 26th of February, 1612; he gives drawings of the configurations, and computations of their revolutions. Now it may be asked from whence did Harriot get the telescope with which he observed the satellites only a few days later than Galileo? Certainly not from Italy; he either made it himself, or he got it from Holland.—*Professor Mohl.*

Area of Circles.—There is an ingenious and simple mechanical mode of proving that the area of a circle is equal to the rectangle of one-half the circumference by one-half the diameter; or, in other words, is equal to that of a right-angled parallelogram, two of whose sides are equal to one-half the circumference and the other two to one-half the diameter. Suppose a circle to be taken and numerous radii to be drawn from its centre to its circumference at equal distances from each other; then let this circle be divided into two parts, each a semicircle; cut through the radial lines from the centre close to the circumference, and open each semicircle out so that the semi-circumference of each part shall become a straight line, the points of one piece will fit exactly into the spaces of the other, and the rectangle in question will be formed.—*Dr. Jones: Franklin Journal.*

Vaulting Extraordinary.—We understand that a few days since, just as a boat, freighted with iron and some other articles, had turned the summit of the inclined plane on her descent at Boston Falls, the chain broke, and the car being thus freed from the restraints of machinery, descended to the foot of the plane with great speed, giving the boat such a hasty plunge into the water, that when she rose on the swell thus created, it carried her over the tow-path at the bend of the canal near the plane, and precipitated her down a rocky precipice of about 200 feet, where she now lies, a heap of ruins, not worth picking up. So high was she raised by the swell, and so rapid her flight, that she scarcely touched the tow path or any thing else, until she struck upon a rock 30 or 40 feet below the surface of the canal, and broke in two near the centre; the two parts thus continued to descend among the rocks, where they now lie. The most incredible and remarkable part of the story is, that there were four persons on board, a woman and three children, who went down the precipice with the boat, neither of whom received any material injury. The captain and hands probably went on shore to walk down the plane, which is frequently the case.—*New York Paper.*

Potato Flour, boiled with milk and a little sugar, forms one of the most palatable, wholesome, and cheap dishes of which a labouring man can partake, and cannot be too strongly recommended to cottagers, who ought always to convert a portion of their potato crop into flour to be used when fresh potatoes cannot be got. The potato in its natural state, well boiled and eaten with milk, is a feast for an emperor; and were men to reflect a little more than they do on the bounty of Nature, they would confess that there is no gift to our mortal part for which thanks to Nature's God are more called for among the ample stores provided for His (alas! ungrateful) creatures.—*Sir George S. Mackenzie.*

Mohawk Mechanics' Institution.—About 2 miles from Brandtford an Indian village has been established, under the charge of Mr. L., a clergyman of the Church of England, sent out by the Society for Propagating the Gospel. Next day being Sunday, we resolved to make a small detour, and attend worship in their church. The institution embraces both spiritual and secular objects. They have a MECHANICS' SCHOOL, where instruction is given in handicraft trades; and many, by steady progress in acquiring knowledge, and in managing their farms, afford sufficient evidence of their capacity to be weaned from the dissolute habits of all human beings, a half-reclaimed savage.—*Ferguson's Notes on Canada: Quarterly Journal of Agriculture.*

Russian Mode of Preserving French Beans, Parsley, Spinach, &c.—Gather the leaves or beans without washing them, put them into a barrel without a head, alternate layers of vegetables and salt. Then put a board upon the vegetables, and a weight upon the board, which will now be covered with the juice of the vegetables. When wanted for use take out the quantity required and wash it, carefully retaining the board and weight. The best weight is a clean water-worn stone, tolerably heavy. The watery juice toward the board excludes the action of the air and prevents putrefaction.—*Dr. Howison.*

New Species of Wheat.—A variety of wheat which does not seem liable to the attacks of the wheat-fly has been accidentally found. It is most prolific, grows a foot taller than the common wheat, but is not like the Revel wheat. It is awned, and somewhat like the Egyptian, but of a clearer colour, without the protuberances of the latter. If once a supply of this variety for seed is found, the fly will be starved. Of a patch standing in the middle of a field, where every ear of the common wheat was hurt, and where flies were very numerous, not an ear was touched, although other bearded varieties suffered.—*Mr. Gorrie: Highland Society Transactions.*

INTERIM NOTICES.

All Advertisements for the Covers of the Monthly Parts, are requested to be sent into the Office before the 25th of each Month.

Can S. P. favour us with a more particular description of Mr. H.'s apparatus?

"Publicola's" letter is simply an advertisement.

We think N. S.'s patent void; but as the case is not possessed of any public interest whatever, we should not be justified in appropriating any portion of our columns to its discussion.

Communications received from Trebor Valentine—Baron Drais—Mr. Ashbrook—A Brass Turner—Captain Forman—D. C.—M. M.—Lector.

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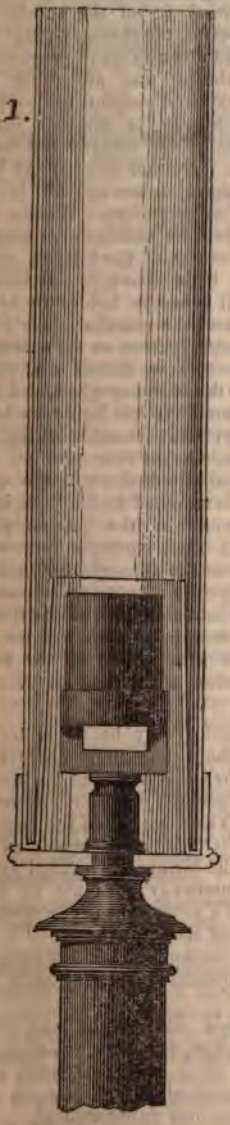
No. 463.] SATURDAY, JUNE 23, 1832. [Price 3*d*.

TAYLOR'S IMPROVED GAS BURNER.

1.



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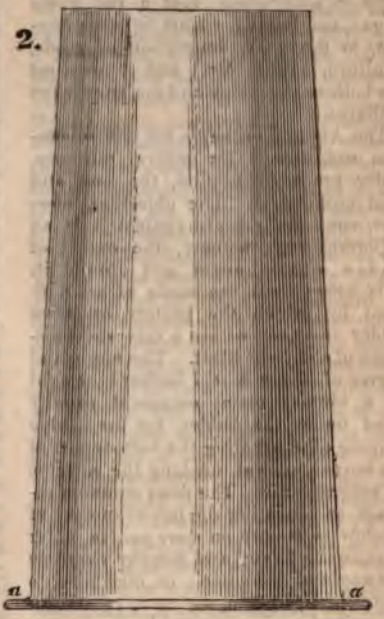

3.

IMPROVED ARGAND GAS BURNER.

Sir,—Since the introduction of gas into nearly every important place, it has become an article so generally adopted that it is needless to apologise for any attempt at improvement in the apparatus for burning it. It cannot have escaped common observation, that a vast waste of gas continually occurs in consumption, to the great destruction of goods, furniture, health, &c.; and a manifest loss both to the public and the proprietors of shares.

The Argand burner is the one in common use, and is, for general purposes, under proper regulation, the best and most economical. The objection, however, continually heard against it is an important one; namely, the extent of shadow created under and around it. This arises from the mode of arrangement by which the gallery or glass holder is placed within a very short distance of the light itself. The angle and degree of shade is still farther increased by a clumsy metal ornament usually fixed under the holder, for the double purpose of concealing the bottom part of the burner, and of breaking the currents of external air. The most common attempt at obviating the inconvenience of shadow is to turn on *more gas*, in order to raise the flame, and thereby decrease the angle of reflection; or, otherwise, to move the light to a distance, creating a necessity for a larger sized burner.

Another imperfection in the common argand is in the mode of admitting atmospheric air (whether in an unlimited degree or by regulation) at a distance below the flame. In proportion as this irregularity exists, and the distance is extended, is the departure from the principle of a true argand. Hence the flame is unsteady, burning spirally, and often terminating in smoke, unless counteracted by a long and disproportioned chimney-glass.

Various improvements have been attempted in gas burners, some of which have obtained patents. If in some respects these have an advantage over the common burners, in others it is counteracted by a farther evil, particularly that of increased shadow.

A reference to the accompanying section, *Fig. 1, will show* the method by *which I remedy the imperfections* I have noticed. It is at once accomplished by lowering the situation of the glass-holder; and by the addition of an interior conical conductor, as a regulator of the atmospheric air. The glass-holder is taken (a bottom plan of which is shown in fig. 2) from its old position as an appendage round the burner, and placed *underneath it*, on the summit of the pillar or stand, the chimney-glass being lengthened downwards in proportion, and thus inclosing and protecting the whole from external currents and vibrations. The burner is screwed down upon the glass holder, making the latter a firm fixture. Neither this nor the bottom end of the glass are subject to become heated as heretofore. Within the holder is placed the conductor, rising to the level of the top of the burner, or, if any thing, a little above it. It should fit pretty well into the holder to avoid motion. Round the exterior lower edge of the conductor (shown on an enlarged scale in fig. 3) is a flanch *a a*, upon which stands the chimney-glass, and this is now rendered far less liable to accidental falling; with tolerable fitting, no air can find access in this quarter, but can only be admitted through the conductor, and is supplied to the light in a given proportion in the proper part, namely, on a level corresponding with the interior passage through the burner. The whole surface of atmospheric air is thus brought into contact with the flame. The latter becomes remarkably steady, and this new arrangement of the parts leaves no shadow of the least importance remaining.

The conductor may be of metal or of glass. Perhaps the general appearance of *ground glass* is the best, and the burner (usually an unsightly object) is concealed altogether. The diameter of the summit of the conductor must be regulated by the size of the burner, measured externally and internally; the air in both ways bearing a proportion to the surfaces respectively of flame to be acted upon. The point of economical consumption of gas may be obtained by attention to this particular.

A condensed white light with complete combustion, is not so favourable to illumination as a more extended and somewhat coloured flame, in form not too cylindrical, but rather conical.

As a whole, I think the general appearance of my gas-burner is more pleasing to the eye than any other I have seen; whilst, without any extra expense of fitting worth notice, much is gained in comfort, cleanliness, and utility—and abolishing the usual pretexts for waste and extravagance. In making experiments on this subject, I was actuated by motives of personal convenience, and chiefly as regarded *shadow* in the first instance; but I may add, that burners fitted up on my principle may be seen, and are supplied, at the manufactory of Messrs. Haseldon and Treffey (late John Martineau) engineers, Windsor-terrace, City-road.

I am, Sir,
Your obedient servant,
H. TAYLOR.

Chiswell-street, London,
June, 1832.

AMERICAN RIFLES.

Sir,—The request of your correspondent, H, with respect to American rifles, in No. 453, has not been forgotten, but the aspect of the time was such, as to call for the use of weapons, rather than for their description; and every man to whom the welfare of his country was dear, had "stiffened his sinews, summoned up his blood," to enter into the holiest of all contests that can give a just cause for human slaughter—the fight for human freedom; to enter into the contest with the resolve to return a victor, or never more to return. But the imprint of each stern brow told so well the tale of the inward resolution, that the spoilers were scared from their prey ere an arm was lifted to the strife, and the peace of freedom smiles upon us. It was said, in former years, that Sir William Addington retired from the practice of the law, to devote his time to the study of it; and even so may hard-handed mechanics now forbear the use of weapons, to study their mechanical construction.

I am not aware that any work is published treating of American rifles, but such information as I possess is at the service of your correspondent. I will first describe one which is at present in my possession. The barrel is 3 feet 1 inch in length, including a hardened patent breech, which, though advantageous for the prevention of corrosion, and economy of powder, I consider to deteriorate the certainty of aim, by its comparative elasticity, and consequent tendency to vibration. The barrel itself is composed of the softest iron that can be procured, and I believe it was fabricated in the town of Lancaster, Pennsylvania, of native metal. It is of a whitish colour, and leaden feel, like the iron manufactured at Biscay, in Spain, which, when filed up to an angle, will bear cutting with a common knife without injuring the edge. I have seen a minute wire of considerable length taken off the angle in this manner.* The iron found on the coast of Peru, and the enormous mass existing in the province of Santiago del Estero, whereof there is a large specimen now in the British Museum, and supposed to be meteoric, is of the same quality, and of a silvery-looking texture, not readily oxidizing. The barrel of my rifle is octagonal, measuring 1 inch at the breech, and 7-8ths of an inch at the muzzle. It is of the class known as a "squirrel-gun," and is lighter than usual, but the barrels are better when parallel from breech to muzzle. The calibre is less than 3-8ths of an inch, and it carries a ball of 100 to the pound avoirdupoise. The spiral grooves are 7 in number, each about 1-16th of an inch in width, and half that depth, making one turn in the length of the barrel. It discharges with a percussion-lock, and is provided with a hair-trigger. The front sight is of silver, sharpened to a gable ridge, and placed within an inch of the muzzle. The back sight is fixed on a spring, which elevates by means of a screw, for long distances. The notch in it is cut with the blade of a thin knife as fine as possible, and it is placed about 9 inches from the breech. The percussion-lock, though more certain than the flint, is not considered so good, because the violent stroke of the spring is apt to jar the barrel from the aim. The barrel is mounted on a short stock of walnut, and the ramrod of red-wood, as large as the calibre will admit, runs along a rib soldered beneath the barrel, which is plain, not twisted. A twisted or riband barrel is of no advantage, except to give strength when the material is light; in a rifle-barrel it is positively a disadvantage, for the imperfect welding gives a roughness, and pieces are apt to chip out in the spirals. The stock is handsomely mount-

* The fame of the Spanish barrels has arisen from their being made of this tough iron, which rarely bursts.

ed in brass, with various silver ornaments, and much expensive engraving. In loading, the ball is placed on a circular piece of greased calico, and pressed down upon the very small portion of powder, with about the same force which is used to the piston of a pump or syringe. No hammering takes place, as in the English mode of charging. To ensure the truth of the flight of the ball, its sphericality must be as perfect as possible. With this rifle an ordinary shooter may at 120 yards throw 50 shots in succession into the crown of a hat, within the space of an hour, without wiping out the barrel, if he uses good powder. The loading is performed more rapidly than that of a shot-gun, and nearly as rapidly as that of an ordinary musket, with cartridges. There is yet another advantage in it. Common guns are discharged with considerable risk to the shooter, who exposes his whole front to the enemy. This, like all the rifles of the American hunters, is constructed with a thin stock, hollowed at the butt-end into an arch, fitting the right-arm at the elbow-joint. The barrel is then laid into the hollow of the left-arm, and the rifle may be aimed and discharged, *parallel* to the chest, instead of at right angles with it. Thus, shooting from behind a tree, or the corner of a house, no object is presented to the enemy save a part of the head and the left-elbow. The absence of vibration in the barrel is the cause of its effective shooting; and the absence of vibration arises, first, from the great weight—secondly, from the soft metal. The price in the United States of such guns as I have been describing, if plain, is about 30 dollars; but they may be ornamented with silver, up to 100, or even more. An Albanian would jump for joy at the sight of them, so elegant are they in their appearance.

But very true and effective rifles, such as a frontier-man can depend upon to ensure his dinner in the wild woods, or to bring down an Indian from behind a tree at 150 yards, are sold retail for 14 dollars, and wholesale for 10. The size preferred by the hunters for all game, including elks, buffaloes, deer, bears, panthers, and men, if needful in self-defence, is about 60 to the pound. Such *rifles are very* considerably heavier than *a musket, or English* rifle. The rifles *made in England* are too light in the barrel to be true. They usually carry a ball of 20 to the pound; and the barrel is not so heavy as that of an American rifle of 60. An objection may perhaps be made to the weight, as an incumbrance to the bearer; but it must be borne in mind, that 60 charges of powder and ball only weigh about 1 pound and a quarter, whereas for the English rifle 60 charges will exceed 3 pounds and a half. Is not the extra weight better carried in the hand than at the girdle? And if we double the quantity, making 120 rounds, the Englishman will have to carry 4 pounds and a half to 5 pounds more ammunition than the American—something in bulk as well as in weight. The largest rifle I heard of in the United States carried an ounce-ball, and it was said that the maker, who lived in the western part of the State of New York, could strike the length and breadth of a man with it at 500 yards distance! But its weight was so great, that it could only be used with a rest, and it was almost a load for a man to carry. I have reason to believe that the statement was correct, but I did not feel disposed to travel 30 miles, and back, to verify it. Most of the American hunters can repair and new-stock their guns, and freshen the grooves when worn, and many of them can make a rifle with their own hands. All of them suit the sight to their own liking. In short, a good rifle-shooter must be a tolerable mechanic. It is the weapon of a citizen, and all people should understand the use of it. Soldiers with common muskets rarely hit a mark in action; a man used to a rifle, rarely misses. A nation, all whose adult males were rifle-shooters, could scarcely be vanquished by an invading army even of riflemen, because they would have the advantage of knowing the ground. Then each man could practise with his weapon as a holiday amusement, even by himself, and he would require no training. All he would require would be cover. The battle of New Orleans was decided by rifles in the hands of untrained hunters, behind hastily-raised barricades. At the siege of Ciudad Rodrigo, in Spain, a Frenchman was let down from the walls, and, skulking about amongst the ruins, killed 100 of the enemy with his own rifle in three days. The length of barrel preferred by some of the old American hunters is 3 feet 6 or 8 inches; not that the long gun

carries farther, but because it affords a truer aim, by the distance the sights are apart, and consequently the diminished liability to error. No iron ramrod is ever used, as it would damage the grooves, and destroy the accuracy of the barrel. It is evident from what has been said, that the great advantage possessed by the American rifle over the English one, is in its more scientific construction of barrel. Every nation excels in the articles most essential to it; and the war and hunting constantly pursued by the pioneers of the woods in America, has made the rifle as necessary to them as the axe; consequently, their attention has been constantly directed to achieve perfection in it. The English would have done the same, only they preferred the shot-gun, in which they excel the Americans as much as they are excelled by them in rifles. An English sportsman would grumble at carrying a heavy rifle for a whole day; but assuredly there is more skill in striking an object with a single ball, than with several hundred shot which cover a space equal to the face of St. Paul's clock. In hunting the black squirrels in the American woods, he is considered a bungler who hits any part but the head, as the small ball which revolves, makes a larger hole than an ounce-ball from a smooth bore, and spoils the skin. A rifle-ball, to distinguish it from that of a musket, is frequently called a "ragged bullet," on account of the ragged wound it makes. My dissertation has been rather "lengthy," like some of the barrels, but I shall be happy to give any farther information your correspondent may need, at a future time.

I remain, Sir,
Yours very truly,
JUNIUS REDIVIVUS.

CARTER'S IRON ROOFING.

Sir,—Your number (454) for April last contains a communication from Peterhoff, with some observations upon my cast-iron roofing, but as your correspondent has said nothing against its principle, I shall not have to trouble you at any length. Your correspondent remarks, that "there is nothing new under the sun; and then goes on to say, that thirty years before the time of an old English settler *there, a roof had been covered with cast-iron in the form of* common pantiles. Your correspondent quotes the eighth volume, page 328, of your excellent Magazine, which describes my roofing, and where also I have been favoured by an engraved elucidation, the slightest glance at which must satisfy any one, that there is not the least resemblance between the cast-iron plates there described and the common pantile; unless the use of the same material constitutes a resemblance. Your correspondent describes these cast-iron tiles as being laid at an angle of 60 degrees—one of the advantages of my mode of covering (and that I consider as not of the least) is, that mine can be laid (and I have laid many so) at the low angle of 8 degrees; and, if required, I could, by increasing the length of my plates, lay my roof at even a lower angle than 8 degrees. The pitch of my roof is so low, that in computing the quantity required, I have only to take the square of the building; but at 60 degrees, the area to be covered would be doubled, so that this Russian roof requires in material double the quantity required for mine, and yet your correspondent believes them to be the same!

I complain not of fair criticism—on the contrary, I would court it—but, such old saws as "there is nothing new under the sun," are not criticism; such observations elicit nothing, and have a mischievous tendency, being calculated to increase a propensity already too prevalent, that of invading patent rights.

One excellence your correspondent has confirmed, that is the durability of cast-iron; for it appears the Russian cast-iron tiles have already endured more than 70 years, and are as good at this present moment as when first laid on, without having ever been painted; this is a confirmation of what I have before stated, that with a coat of paint once in eight or ten years, there would be no limit to the durability of such roofs; and the cost of an occasional painting is as nothing, when compared with the expence of repairs for every other description of covering.

Your correspondent from Russia has closed his remarks in a manly manner with his name, and is therefore entitled to respect; but not so a subsequent communicant, who makes his attack upon iron roofs under the shield of an anonymous signature, which, but for the pre-

sent opportunity, would not have been considered worthy of notice. This writer proceeds in the way of CAUTION against iron coverings, because a shed so covered in the neighbourhood of Birmingham, had by the heat of the sun given some cow the head-ach.*

I believe the interior of any building, if left with the bare covering, whether of iron, slate, tile, or what not, without the intervention of a ceiling, would occasionally be both hot and cold; and it must be admitted that metals are rapid conductors of heat; but what building, I would ask, above the class of a cow-shed, is so circumstanced? I have never heard any complaint of either heat or cold, of the dwelling-houses I have covered; nor do I believe that in any *open* shed, although covered with iron, such an effect as described could be produced upon men or cattle. I wonder how many of your readers will believe the "blistering of the fingers," by the mere touch of the under side of the iron covering! This blistering story reminds me of a nursery caution to children against *fibbing*, which is said to produce blisters on the tongue. *Query*—was it not the writer's pen that blistered his fingers?

If this article had not already extended beyond the proposed limits, I could give a list of "churches, warehouses, dwellings, and public buildings," covered with my roofing, together with some considerable business now in progress, which at least proves the *preamble* of my prospectus; or, the distinguished architects under whom I have been employed would never have adapted my covering to buildings under their controul.

I am, Sir, yours, &c.

E. CARTER.

Exeter, June 14, 1832.

LIVERPOOL AND MANCHESTER RAILWAY—STEAM AND HORSE CARRIAGE.

Sir,—I was somewhat surprised at the appearance in your journal, some two or three weeks past, of a statement to the effect that the Directors of the Liverpool and Manchester Railway intended to substitute horses for the locomotive-engines. I then paid little attention to this assertion, not doubting that it would speedily be refuted by some of your able friends. Seeing, however, that this statement has recently been referred to as fact by another of your correspondents, and also that it has been copied into some provincial journals upon the authority of your Magazine, I think it worth while to do what I am surprised that no one has done before me—to state at once the unmixed error of this assertion. Here, perhaps, you will permit me to remark how great caution should be used in giving the sanction of what should be the *most accurate* calendar of mechanical science, to erroneous versions of such easily ascertained facts as the intentions of public bodies. In this case, if I remember right, you are free from blame, as a name was affixed to the assertion which you would naturally rely upon as a sufficient guarantee for its correctness.* It will be found, upon inquiry, that the Directors of the Liverpool and Manchester Railway have never designed to replace them by horses as a moving-power. This would, indeed, be going backwards with improvement, and the report can only have originated in the thousand and one exaggerations of the expenses attending the wear and tear of the locomotive-engines. That these expenses have exceeded the anticipations of all parties is well known—but not to a hundredth part of the extent supposed by some ill-informed people. The Directors will always be convinced of the cheapness of steam as a mover, whilst they can divide between 9 and 10 per cent., with increasing profits, on their capital, at rates of carriage so low as to beggar all competition by canal, road, &c. And this, when the interest upon the cost of the road at 5 per cent. will be nearly £50,000! Of course, the construction of these engines is in comparative infancy, and every day brings some fresh invention of talent to remedy defects which experience alone can detect. Thus it must be with all important inventions; and this is thought to be no reason for abandoning them, but the very contrary.

Your obedient servant,

QUIVIS.

Liverpool, June 4, 1832.

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* *The radiation of heat through* iron may be prevented *by painting or whitewashing* the under side.

* The statement alluded to was contained in an extract from Mr. Gordon's book on Locomotion.—ED. M. M.

THE MARQUIS OF LANSDOWNE'S PRINCIPLES OF COMMERCIAL SCIENCE.

Sir,—I shall trespass but a short time upon your attention. Your correspondent's letter (Kalopino) is dated the 8th. On the 12th, Mr. Daniel Hardcastle, a well-known commercial writer in the *Times*, appeals to M. Mongez, a Member of the Institute, and one of the Directors of the French Mints, to prove, that the error which was committed upon the enactment of Mr. Peel's Bill, in 1819, in mistaking the value of 14 pounds 159 of silver, for 15 pounds 0725 of silver, has amounted annually to £2,000,000. Mr. Hardcastle, alluding to the Committee of the House of Commons, on the Bank of England Charter, asserts, with every man who has thought on this subject, that the debts of all the foreign nations throughout the world are payable in silver; whereas, were the English bankers possessed of all the silver in the world, they could not by law discharge with silver any debt of larger amount than 40 shillings!!! In advocating in this journal, the commercial principles of the Marquis of Lansdowne, I have appealed not to foreigners, but to Englishmen of science. I have asserted, No. 444, that throughout the entire period of the suspension of cash payments, the Spanish dollar was issued by the Bank of England at 60-pence, which is the American, Asiatic, French,* &c. value; that the American, French, Dutch, Russian, and Chinese property is valued by decimal arithmetic: while English property (even tithes) is valued duodecimally. And, that the North and South American proportionate value of silver to gold is neither 14·159, nor 15·0725, but 16. Indeed, the last New York quotation is 16½ dollars for the dobloon. However, Mr. Hardcastle advocates Mr. Baring's novel theory of a double standard.

To oppose those *facts*, your correspondent is, of course, perfectly at liberty "to enter the field." I very cheerfully retire from it.

Your correspondent has, however, done me an injustice, which I expect he will have the manliness to acknowledge. One of the many benefits already conferred by Earl Grey's Government is, that the Colonial lands are no longer the private property of the Colonial Minister. The Colonial lands are no longer given away *gratuitously*. In this instance, the policy of the United States is adopted. Why, then, not appropriate the monies received for the Colonial lands to home colonisation? What I did state (No. 455) is, that the military pensioner who was disposed to emigrate should pay for a "*Colonial freehold*," containing as much land as he could possibly cultivate in ten years, 100 shillings; and receive the remainder of the value of his pension in money. The American soldier receives the entire value of his pension in land.* I have stated (No. 448), and restated (No. 455), that the home-colonist, or road-labourer, should be rent-free; that 60 days' labour in the year should be extracted from him, is no suggestion of mine.

It remains for me to thank you, Sir, for having permitted me through the medium of this most popular journal of science, to contrast the English with the foreign systems of accountability. Mr. M'Culloch's Commercial Dictionary is an invaluable work upon this branch of science.

I have the honour to be,
Sir,
Your very obedient servant,
T.

Errata, No. 462, p. 171.—For $\frac{52,764,444}{5,113,353}$ = 13·189, read 10·3189.

CHURCH SEATS.

Sir,—Thinking your fair correspondent, F. H., could prefer any thing to sheer neglect, I will venture two or three reasons that must operate against the adoption of her plan (see p. 425, vol. xvi.) in either old or new churches; first, it would considerably enhance the expense both in labour and materials; second, a height of three feet above the seat, for the back of the pew, I fear would be found a greater evil than the one it is intended to remedy, as it would entirely preclude a sight of even the pulpit from persons sitting at any distance; third, increasing the width of the pews nearly one-third, by reducing the number of

* 5 francs 43 × 16⅔ dollars = 1 English pound weight, *if France exchanges with North and South America 16 ounces.—Annuaire.*

* To this American rule there is an exception, (stated No. 462, p. 166), to the amount of 916,800 dollars. The officers of the American navy, though unemployed, receive full pay.

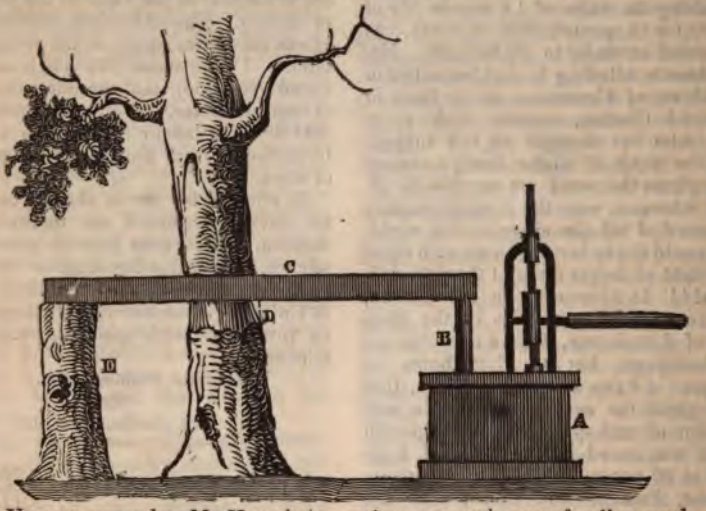
sittings, would of necessity occasion a reduction in the amount of the pew-rents, on which, in many of the new churches, the income of the minister in a great measure depends.

It perhaps would be worth while to inquire how far this evil may have increased in the new churches, more particularly the latter ones; and whether, in fact, it has not been fostered by his Majesty's Commissioners offering, as it were, a bounty for providing this sort of half-purgatory for his Majesty's lieges, by entrusting the buildings to those architects who could plan the greatest number of 18 or 20-inch sittings at the least cost.

Yours respectfully,

TREBOR VALENTINE.

APPLICATION OF BRAMAH'S PUMP TO THE ERADICATION OF STUMPS OF TREES.



Sir—Your correspondent Mr. Hounds (p. 98) enquires for a machine to render the clearing of the woods more easy to the emigrant, and seems to think something in the shape of a circular saw most likely to supply the desideratum. Now, Sir, I have always understood that the axe, in the hands of a skilful woodsman, is as efficient an instrument as need be desired for the mere clearing, but that it is the stumping, or getting up the roots, which is the most difficult part of the business, and for which some new process is the most imperiously required. The usual way, I believe, is to leave the stumps in the ground until they become rotten in the course of Nature, which takes several years, during which the settler has to plough round them. Those who have capital sufficient, make use of machinery, set in motion by horses or oxen, to pull out the roots at once; but *this process is of course out of the reach of the poorer classes of emigrants, who have very little money to spare for implements, and none for live stock.* To this class, perhaps, a machine like that represented in the prefixed figure, might prove of essential service. Its cost would not be very great, and its application would be particularly easy:—

A is a Bramah's pump, from its great power and simplicity the best moving force for the purpose.

B the solid piston, on which is placed one end of

C, a strong beam of timber, fitting in

D, a notch cut in the tree to be felled. The other end rests on

E the stump of a tree, or other convenient block, near the tree operated upon. When the pump is worked, the beam C will of course be raised, and the tree must necessarily rise with it. It might perhaps be requisite to dig a little round the roots, and to cut some of the principal ones, but of course the power exerted might be increased to an immense extent, by employing a longer beam, so as to gain a very long leverage. If not

) fell, or rather to raise, a growing
' the roots, this machine might be
t service in extirpating the stumps,
ans of an arrangement similar to
mployed in drawing the piles of
leo Bridge, as described by Mr.
in vol. 13, page 184, of the Me-
s' Magazine.

ther correspondent, P. M. (also
ge 98) has proposed a plan for
itting ready-made cottages to Aus-

The usefulness of this may be
d, especially when it is recollected
wooden house, which was sent out
v South Wales at the first estab-
nt of the colony to serve as a hos-
took *several months* in erecting at
ce of destination, although it had
put together in London in a few
! Besides, it will never pay to
a ready-made house *more* than
) miles.

Yours, &c. F. H.

1832.

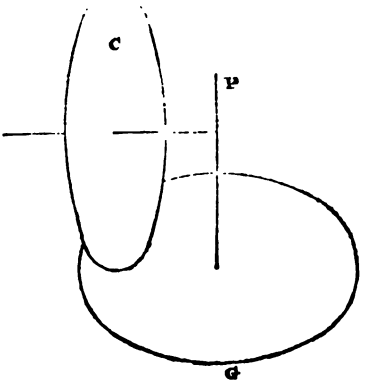
bsequently to the reception of the
ing communication, a letter came
r hands, without date, signed
'. A., a brass turner," in which a
ition very similar to that of our
ied friend F. H. is made in these
: "Do you think that a powerful
made upon the principle of Bra-
Hydraulic Press would raise the
of trees from the ground? If it
be applied, I think the benefit to
or Emigrant would be very great;
ally if matters could be so arranged
e could engage one at so much per
—Ed. M. M.]

: PARADOXICAL THEOREM, P. 77.

—I need scarcely tell you that I
ry little of a mathematician; it is,
ore, perhaps somewhat presump-
in me to attempt to point out the
k link" in the demonstration of the
oxical theorem, p. 77, viz. "straight
cannot be drawn from each and
point in the circumference of a cir-
rpendicular to its diameter." The
of your correspondent commences
or, by assuming a diameter equal to
usand times nothing, as Euclid's
efinition declares that a point has
agnitude; but if we may suppose
ly means that it should be made up
thousand minute spaces, and the
circumference of fifteen hundred
spaces, and both divided by points;
first line bisect both diameter and
circumference, then as every other perpendicular to the base must be parallel to this, it is absurd to think of drawing them through points that are divided on any lines which are not themselves parallel to each other; but, by definition the second, a line has no breadth, and as 10,000 times 0 will not constitute the smallest portion, so 10,000 lines whose breadth are equal 0, cannot occupy one of the minute spaces in the circumference; therefore straight lines can, &c.

Yours, &c. TREBOR VALENTINE.

GRADUATION OF CIRCULAR ARCS.



Sir,—Business prevented me from having long ere this acknowledged my obligations to your correspondent "Trebor Valentine." Now, however, through you, I beg to thank him for his correction of the error, upon which I had heedlessly formed my proposition for a new application of the tidal force: and so I kiss the rod.

Perhaps the following proposition, though it be from the same mint, may engage his attention, or that of some other of your correspondents.

The *graduation of right lines* is performed with all possible accuracy by Mr. Ramsden's application of the method technically called stepping; but the application of the same method to the *graduation of circular arcs* is still, I believe, a desideratum. I endeavour to fill up the want thus:—

Let the circle to be divided be fixed so as to revolve with its plane horizontal: let its axis be prolonged above its plane to a length greater than its radius. Prepare another circle of a diameter somewhat greater than the former, and let it

be fixed so as to revolve on the plane of the horizontal circle, while its own plane is vertical, and its axis is joined at a right angle with that of the horizontal one, in which latter axis is the centre of its revolution. As in figure, where G is the horizontal circle, C the greater circle, and P the point at which the axes continue always at a right angle, while their respective circles revolve. If 360 be the number of parts, into which the circle G is to be divided, estimate a distance somewhat less than a degree of G, and step 360 such distances on the limb of C. Now, though these equal parts are not degrees of either C or G, yet, inasmuch as they are equal and 360 in number, they are degrees of some circle on the plane of G. It remains, therefore, only to find that circle, to lay down the parts on it on G from C, and the degrees of all concentric circles are had. For common purposes, such as the cutting of wheel-work, this may be easily done by trial, viz. by making the circle C moveable by a slow screw along its axis towards P, by which means no very tedious trial will find, with sufficient accuracy, the place on the plane of G where the 360 parts are run over in one revolution of G. To satisfy the critical accuracy, however, which mathematical purposes require, the trial might prove endless; and here, I fear, I must fall short, unless some of your correspondents can help me a step further than I have been able to go. I beg, therefore, to submit the following problem for solution :—

Let several concentric circles be drawn, draw also a radius to the outermost. Estimate a distance less than an aliquot part of the largest circle, and greater than the same aliquot part of the least. Begin at the concourse of radius and the circumference of the largest circles, and at its intersections with the others, and lay down in the same direction the estimated distance to the number of parts it was estimated for, suppose 360. It will be found, that while Zero is on radius, the point 360 describes a double curve. Now, bisect the several intervals between 0 and 360, and throw half of each interval to the other side of radius, and call the new points thus obtained 0′ and 360′. Both *will now be found to* describe double *curves intersecting,* and the point of intersection will be in the path of the circle, of which the aliquot parts estimated are true parts. The problem, therefore, is, having thus found several points in the path of each curve, to lay down the whole of each, so as to find the point of intersection. If this can be done with sufficient practical nicety, and a circle described through the point of intersection on G, then the parts estimated on C will be true degrees, and may be laid down accordingly.

In conclusion, Mr. Editor, permit me to take this opportunity of mentioning, that in the description of the "Hydrostatic lavement instrument," in No. 454, either your printer or I omitted to state, that the tube B should be about 3 feet long. I beg also to be allowed to change my signature (which ought to have been A B T C D, not F T C D) into the less unwieldy one of

Φ. M.

Portaferry, Ireland,
June 11, 1832.

ON STREET PAVING.

Sir,—A Worker of Horses, &c., at page 147, says, "It is a very small portion of the periphery of a waggon-wheel which impinges on the stone at one instant of time; and as the contact must first be on the edge or end of each stone, the opposite edge, or the reverse end, must be raised up." A little consideration, however, will show the fallacy of this view of the case. For if one end of a stone were to be so pressed as to exert a tendency to sink down, the upper portion of that end would be thrown forward upon the adjoining stone, and the lower edge of the farther end against the opposite stone; and if these stones were so tightly wedged into their places as not to admit of motion, any change of place in the stone under pressure, must be in a perpendicular direction—angular motion being prevented by the lateral resistance of the adjacent stones. Such is the case in the new *sovereign* pavements, the stones of which being from nine to ten inches deep, and tightly fitted and cemented together, offer a very considerable resistance to lateral as well as perpendicular motion.

I perfectly agree with all that the above writer has stated respecting the large cross-grooved paving tried in Barbican and Fleet-street, which certainly

proved a most decided failure; although I believe other circumstances as well as the mere size of the stones, contributed to the failure of these pavements.

My own opinion is, that paving-stones *of this size* are quite as objectionable as the *smallest;* there is a medium in all things, and depend upon it, *four by fourteen* will ultimately carry the day.

Yours, respectfully,
W. BADDELEY.

June 19, 1832.

BARON DE DRAIS'S TRIANGLE METER.

Fig. 1.

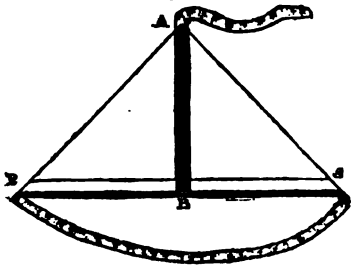


Fig. 2.

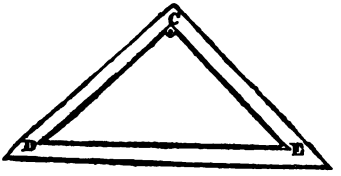


Fig. 3.

Fig. 4.

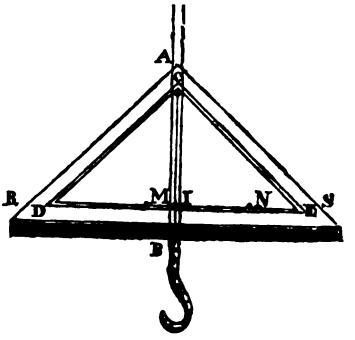
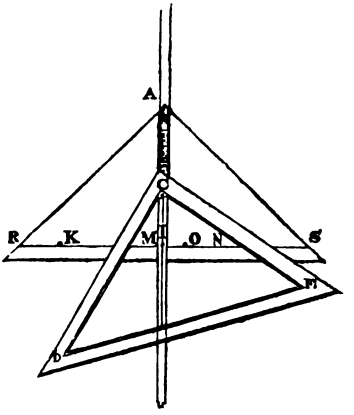


Fig. 5.



Baron de Drais presents his compliments to the Editor of the Mechanics' Magazine, and requests he will do him the favour to insert in his work the following description of his Triangle Meter. By this instrument a triangle of a certain base and altitude may be changed into another of a given base, or into a parallelogram of a given base. It can be employed by surveyors with more than double the advantage that any other instrument or mode of calculation, yet known, affords, *in measuring* a district of land.

London, June 2, 1832.

Description of the Triangle Meter, invented by Baron Charles de Drais.

The theorem on which the principle of this instrument is founded is the following:

"*The square of the perpendicular line, from the vertex of the right angle in a rectangular triangle, is equal to the product of the two segments of the hypothenuse.*"

The instrument consists only of three parts, of wood or metal.

Fig. 1. A rectangular and isosceles triangle with a groove, A B, perpen-

dicular to the hypothenuse, and the line RS parallel to the hypothenuse. On the corners are ribands for fastening the triangle to a table.

Fig. 2. A triangle of the same size, formed by three rules whose sharp sides are inwards. The sides DC and CE have for their vertex the little hole in C.

Fig. 3. A slider which fits exactly into the groove AB. Its surface forms a plane with the surface of the first triangle, when fitted into the groove. In the middle of it is a straight line, FG, with a little hole near F, and a riband in G.

The 4th figure shows the whole instrument.

The second triangle is combined with the slider by a peg through the holes C and F, around which it turns.

The manner of employing it is the following:—

The height and base of the triangle, which is to be transformed into another of a given base, are taken off with two compasses; then the point of one compass is placed in I (Figs. 4 and 5), and the other, for example, in M. One point of the other compass is also placed in I, the other, for example, in N. Now the two points in I are held up, and the slider with the second triangle is moved down till the two sides CD and CE touch the points of the compasses in M and N. The instrument will then show Fig. 5, $CI \overset{2}{=} MI, IN$. If IK is now the given base, and the second triangle be turned till the interior side CD goes through the point K, the other side CE will go through a point of the line RS, for example, O, and OI must be the intended line, for OI, $IK = CI \overset{2}{=} MI, IN$.

In order to have the hands at liberty, the first triangle is fastened to a table, and a riband is fastened to the slider and to the body, by the help of which the moving of the slider is performed without laying down the compasses.

The line IK may be, for example, 32 poles by the scale, and other lines of 100 poles may be drawn upon a paper. The lines as IO are transferred upon the latter, one after the other; then, if one of them is measured off, the measured *surface is* $\frac{32 \cdot 100}{2}$ *square poles* = 10 acres.

If the sides of the triangle are too great, it may be divided into others.

[We recommend this instrument to the attention of our surveying friends (it may be had of Mr. Cary). It appears to us to be constructed on a sound principle, and likely to be of great use in practice. —Ed. M. M.]

MAXIMUM WEIGHT OF RAIN WATER AND ALCOHOL.

Sir,—Your correspondent T. states (vol. 15, p. 382) "For every latitude the maximum weight of rain water and alcohol is as - - 5 : 4

So is the centigrade - 100 : 80

Fahrenheit is wrong - 212 : 174"

It would appear from the above statement, that T. concludes Fahrenheit's thermometer must be constructed on false principles. It is not, however, clear, whether he means 174 to be the true or false temperature of boiling alcohol. I find it stated, in several modern works on chemistry, that alcohol, whose specific gravity is 800 (which T. supposes it to be) will boil at a temperature of 176 of Fahrenheit. It is probable, therefore, that T. finding the numbers 212 and 174 are not in the ratio of 5 to 4, has inferred that Fahrenheit's scale is constructed upon erroneous principles, and that this last ratio should be 212·169$\frac{1}{5}$; that is, when the specific gravity of alcohol is 800, it should boil at a temperature of 169$\frac{1}{5}$. I find it stated, that mercury will boil at a temperature of 348·99 by the centigrade scale, the specific gravity being 13$\frac{1}{2}$ and 660 of Fahrenheit's. Are these numbers right? And if not, what should they be? Perhaps T. will have the kindness to explain this important subject a little more fully.

Yours, &c. John Fisher,
A Working Optician.

Little Britain, May 29, 1832.

STATE OF NAVAL ARCHITECTURE IN ENGLAND.

Sir,—The remarks of Mr. Bayley, in No. 458, on the miserable modes in use for joining the timber-work of vessels together, are perfectly correct. Ship building in England, especially in the Government yards, is in a very low stage; indeed, I scarcely know which is worst, the iron-work, or the wood-work. My attention was first drawn to the former by see-

ing some rudder-fastenings which came off a Government vessel to which Collinge's spherical hinges were ordered to be applied. The rudeness of the work could only be equalled by that of a Spanish trapichi-mill for grinding ores. We have been accustomed to pride ourselves very much on our sea doings, but in what regards marine mechanism we are far behind other nations. Look, for instance, at the Government 10-gun brigs, which are bark-rigged, and ply as Post-office packets. Formerly the Post-office was accustomed to contract with private individuals for vessels, and they were then good, safe, and convenient for passengers. But the Government some years ago snapped up the patronage for the sake of enabling Lieutenants in the navy to become floating hotel-keepers; and now passengers are obliged to run the chance of drowning at an exorbitant rate of payment, from all ports not much frequented by merchantmen, or better vessels. Several of the Post-office packets have been lost at sea, supposed to be upset in squalls by their want of proper porportion, and all on board have perished. I once endured a three months' purgatory on board one, which was so crank that it was more by good luck than any thing else she reached England in safety. Many times, in a squall, have I grasped the weather-shrouds, ready to spring on her broadside, in case she capsized. It is not right that the lives and pockets of passengers should be thus ill-treated, for the sake of putting Lieutenants on full-pay and perquisites. It was provoking enough to have a constant foul wind; still more provoking to see every passing vessel leave us astern—a Frenchman one day dangled his table-cloth flag at us in derision as he bade us adieu; more provoking still to eat salt provisions for want of the necessary stowage for fresh; and, worse than all, to have one's baggage spoiled by the contact of the iron water-tanks.

Government patronage for unworthy purposes, and the absence of responsibility, has been the great evil under which England has for a long period laboured, in public works, as well as other matters. I have seen it some where stated, that in the King's dock-yards there is one foreman to about fifteen men, in the merchants' yards, one to seventy-five; yet the merchants' work is by far the best performed, in proportion to the expenditure. Why is this? The answer is simple; there is responsibility! But in sailing-vessels, for the purposes of swiftness, many vessels excel the English. The finest vessel I ever remember to have seen was on the stocks at Philadelphia. She was in an unfinished state, and was to be called the Pennsylvania. She was a three-decker, and pierced, if I remember aright, with 148 ports, including bow and stern chasers. Her timbers were all of live oak, so hard as to defy the cutting out a name with a penknife, after the approved Anglo-Saxon fashion, and all so closely jointed, that she would have swam without planking; her decks were perfect joiner's work, and her mould was symmetry. All this could have been done in England just as well as in America; the English workmen are as good as the American, and moreover they are cheaper. Why, then, have the Americans excelled us? Because their Government has been responsible, and ours has been irresponsible! However, for all this, the Reform Bill will apply a remedy.

Why is it that our yacht-sailing people, and other delighters in aquatic excursions, have never yet caused one of the flying-proas used in the Ladrone Islands to be constructed in England. They are the fastest and safest of all sailing-vessels, and the easiest managed, as there is no necessity for going about with them. There is a good description of them in a novel lately published, called "The Adventures of a Younger Son."

I cannot agree with Mr. Bayley that the greatest vibration is in weak vessels, but I do not speak positively on the subject. The theory would seem to be, that the stouter and solider the vessel, the greater should be the vibration. A cracked glass-vessel does not vibrate; a sound one does. A sound guitar or violin vibrates perfectly; cracked ones lose the power of vibration. But a thin vessel, perfectly connected throughout, would probably vibrate more to her engines than a solid vessel perfectly connected throughout. A violin or guitar of thick wood would probably have little vibration.

I remain, Sir,

Yours very truly,

JUNIUS REDIVIVUS.

ILLUMINATED DIAL-PLATES.

Sir,—As the inventor of the illuminated-dials, I feel called on to correct a mistake in the communication of F. H., which appeared in your Magazine of May 19, in which he states that the *great expense* of such dials is the reason of their not being generally adopted in the metropolis, and mentions a sum not far short of £100 as necessary for that purpose. Now, so far from this being the case, the two dials which I fixed at Whitechapel Church cost very little more than £50. These dials are each 6 feet 6 inches in diameter, and are as durable as the tower itself on which they are fixed. The above sum included the expense of new-gilt copper hands, and regilding the numerals. I feel quite at a loss to conjecture why illuminated-clocks are not more generally adopted. They are much more prevalent in the country than in London, I have fixed them in 20 different provincial cities and towns. With regard to the suggestions of F. H., I could prove, had I time, that, even if practical, his mode of illumination would be more expensive, and add greatly to the friction of the clock. As I understand his plan, one piece of glass would be necessary for the inner circle, which therefore must be plate-glass; and as a 6-feet dial is 3 feet 5 inches in diameter, the price of this piece of glass only, including the drilling for the arbor, would be £6. 15*s*. To this must be added the expense of attaching it to the works, painting and gilding, scaffolding, removing the old dial, preparing for and fixing the new, laying on the gas, and other incidental expenses.

I am, Sir,
Your most obedient servant,
J. P. PAINE.

39, High-street, Bloomsbury,
June 19, 1832.

A FEW WORDS TO THE PERPETUAL MOTIONISTS.

Gentlemen,—

"When leave you off your vagaries?"

Five-and-twenty years ago, I entertained the notion of making a machine, not only to work itself, but to put in motion as many traps as Bishop Blaize in the miniature wool-machinery of a show, that used to go about the fairs in the north of England, when I was a lad. As soon as I had got the necessary tools, I made a wheel of brass, with weights, friction-wheels, &c., to be thrown out from the centre on the one side, and brought near to the centre on the opposite side, by means of guide-rings. The whole was made of well-lackered brass, and contained in a frame-work of the best mahogany. So confident was I of its working, that I hardly thought it possible my hobby could fail, and actually prepared myself with a table-cloth to stop it in case it should go so fast as to break in pieces! Conceive my surprise when I found that it would not move without help! I thus gained some experience, and beginning to inquire of men, books, and machines, I soon found that the great enemy to all perpetual or self-acting machines is friction and gravity.

Emerson says, prop. 116, cor. 1. "Hence it follows, that if any weight is moved by help of a machine, what is gained in power is lost in time." Again, cor. 2, "Hence the motion of the weight is not at all increased by any engine or mechanical instrument, (think of that, Gentlemen), only the velocity of the weight is so much diminished thereby, that the quantity of motion of the weight may not exceed the quantity of motion of the power; and, therefore, it is a vain fancy of any one to think that he can move a great weight with a little power, and with the same velocity as with a greater power!" So that, Gentlemen, if your machines or wheels were to run in diamonds, your pumps to be of glass (like the Norwich ones, called expressors!) still you would find a few drops of water necessary to overcome friction; which drops must, of course, be lost, for they cannot be got up to the overshot wheel again without some extra power. It is reported in America (that land of nonsuches) that a clock has been invented, going without help! I have heard of clocks going seven years in England; but, as Peter Keir said of Wolf and Edward's new steam-engine in Lambeth (about, I think, 1810) which ground 19 bushels of corn with one bushel of coals, "that's a thing only to be believed on seeing it." But even suppose you could make a machine to go or work of itself, it could have no overplus power to spare for any other purpose, and would therefore be of no practical utility whatever.

I will allow that perpetual motion-hunting is a very pleasant and exciting pursuit. It may be compared to being in a sort of waking dream, and in the one case so in the other it is very vexatious to be jilted. The only thing I would beg of you is, that you would not trouble our too good-natured Editor with your crude speculations about self-moving machines. (In the 14th vol., there are no less than 19 or 20 notices of such whims). First, get your models or machines to work, then will be the time to report progress.

I am, Gentlemen,
Your well-wisher,
WILLIAM REED.

Peterhoff Paper-mill, near
St. Petersburgh.
January 19, 1832.

DRAWING-PAPERS.

Sir,—Will you allow me, through a page of your Magazine, to make a few observations on drawing-papers, which perhaps may be worth the attention of a considerable number of your readers, artists and manufacturers, few of them seeming to be aware of the essential qualities of that article.

Now that the process of bleaching the materials for paper is so generally adopted, the artist cannot without the greatest difficulty procure a sheet fit to work upon, owing to the opacity of the substance of which it is made. The paper now manufactured is, I grant, as *white*, and the colour *flows as freely* upon it, as any one can desire; but the difference between the old and modern papers is, that the latter will not *bear out the colour*, or give it the *depth* and beauty which is so essential to works of art. Where is that beautiful yellow reflexion, arising from the *transparency* of good paper, on folding, and that soft silkiness of feel? It is a fact, that some of our drawing-papers by first-rate makers have the appearance of boards, and will actually break in two when folded only twice. In short, there is as much difference between the colours on the old and new papers as there is between the appearance of *silk* and *cotton* dyed with the same colours. Fifteen or twenty years ago any school-boy could execute a drawing that was far more eyeable as to colour, brilliancy, and clearness, than hundreds in our water-colour exhibitions, which any person may see who will be at the trouble to compare them.

Of the importance of depth of colour every artist seems to be fully aware, or why all their sponging and scraping of the paper to obtain it—at the expence of all finish, detail, and precision of touch, in his picture, which are first-rate qualities? And why does the engraver strike his best impressions on India paper, but for the diaphonous surface such paper has? I fear I should be trespassing on your pages were I to say more on this point. This bad quality, then, in our paper arises not from want of *whiteness*, or from the colours not flowing freely, but from the filament of it being so *opaque* and so *short*, as totally to obstruct the entrance of both the pigment and the light which produce the depth of colour desired. The difference in the fibres of *cotton* and those of *linen*, may easily be seen; and until we can have paper of such transparent filament (line nor some other substance of that nature) and of *longer* texture, (I do not mean of rougher grain), the art of water-colour drawing will most assuredly decay.

The answer a paper-manufacturer would make to these observations, I know would be, that he could not make such an article on account of the duty imposed on paper; but an artist who is aware of the qualities of good paper, would not care paying double the price for it. Should any of your correspondents know where such an article is manufactured, or where it might be procured, it would confer a benefit both on the manufacturer and artists generally, by giving it publicity in your widely-circulated Magazine.

I am, Sir, yours, &c.
J. E.

Derby, June 9, 1832.

Boiler Explosions.—Sir, In No. 458 there is a notice of Saxula's surety-plates of sheet lead for steam-boilers, and two specimens which had burst are stated to be laying at your office for inspection. No mention, however, is made of the pressure at which the plates burst. Will Saxula have the goodness to supply this? I have a plate by me, composed of a mixture of tin and lead, which I put to a small high pressure boiler; it burst at a pressure of 60 lbs., leaving a perfect round hole of the diameter of the pipe on which it was fastened. I applied to the same orifice a plate of lead alone, not thicker than Bath post letter-paper, and it did not explode at 90lbs. pressure.—I am, &c., F. T.—Beaufort-works, June 15, 1832.

Gold Sands.—According to the investigations of a German naturalist, the river Eider, which traverses

part of the dominions of Hesse Darmstadt, Hesse Cassel, and Waldeck, contains as much gold as any of the rivers of Brazil.

New Cloth.—A new and beautiful manufacture has just been produced at Halifax, which promises to come into extensive use. It is a damask, of which the groundwork is in silk, and the figure in worsted. The effect is almost, if not quite, as rich as that of damask made wholly of silk, yet the price is not more than one half.

Steel Suspension Bridge.— Over the Danube, near Vienna, a suspension bridge of steel has been lately erected by M. Ignace Von Mitis. The span is 234 feet English, and the versed sine 15 feet. A saving of one half in the total weight is calculated to have been effected by the employment of steel instead of iron; the strength also is much greater. All the steel used in this bridge was manufactured immediately from decarbonated cast iron in Styria.

Lord Brougham.—When his Lordship was little more than sixteen years of age he exhibited one of the most remarkable instances of precocious intellect ever recorded, by the composition of a paper containing a series of experiments and observations on the inflection, reflection, and colours of light; this paper he transmitted through the hands of Sir Charles Blagden to the Royal Society, in whose transactions it was printed; and in the following year a paper containing further experiments and observations on the same subject was communicated by him to the Society, and printed in their Transactions; where, in 1798, appeared from his pen, "General Theorems, chiefly porisms in the higher geometry." These papers excited considerable interest in the scientific world. An article by Professor Prevost of Geneva, containing remarks on the optical papers, appeared in the Philosophical Transactions for 1798; and Mr. Brougham is said, at this early period of his life, to have carried on a Latin correspondence on scientific subjects with some of the most distinguished philosophers of the continent.—*Selections from the Speeches and Writings of Lord Brougham.*—The *Athenæum* casts a doubt on this statement; but we can vouch for its being quite correct. The three papers alluded to are all to be found in the printed Transactions of the Royal Society; and were all published before 1798, at which time Lord Brougham, had not, we believe, completed his 18th year. What makes the fact the more remarkable is, that it is only the best communications to the Society—the best, at least, in the estimation of the council—which are selected for publication.

Primitive Properties.—It is very long since we were of opinion that there are three primitive colours, blue, red, and yellow; three primitive sounds, first, third, and fifth; and three primitive tastes, sweet, sour, and bitter. The other senses may also be thus considered. The function of touch is simple resistance, and this has three species:—total, or hardness —partial, elasticity or buoyancy—yielding, or fluidity. To discover primitive smells has defied us.—*Sir George S. Mackenzie.*

London and Birmingham Steam Carriage Company.—A prospectus has been published in the Birmingham papers for a Steam Carriage Company, for propelling carriages by steam upon the turnpike-roads between London and Birmingham. The proprietors purpose to apportion one quarter of the shares to the public, retaining three quarters themselves. The engines are of sixty horse power; and, it is stated by the projectors that their carriage will take a weight of fifteen tons fifteen miles an hour upon an open road, and that it will ascend any hills upon the turnpike-roads.

Leicester and Bagworth Railway.—On Wednesday afternoon, (June 13th), about 5 o'clock, two waggons, laden with about five tons of coal each, arrived at Leicester by the new railway from the pits at Bagworth, a distance of 11 miles. These coals were brought up in fulfilment of a contract that the railway should be made passable by a pr time. The two waggons were dispatched morning from Leicester with about 9 tons of complete the end of the line near the pits, turned laden as above. The waggons are of t construction as those employed between Liver Manchester, with springs. It is expected th road will be finished in about six weeks for t lar conveyance of coal, which will reduce t of this valuable article very considerably in t ty of Nottingham, as well as in those adjo *Nottingham Review.*

LIST OF NEW PATENTS GRANTED THE 20TH OF MAY TO THE 20 JUNE, 1832.

Grant Preston, Minories, London, nautical- for his improvement or improvements in shi passes. Two months; May 26, 1832.

Frederick Steiner, of Church, near Bla Lancaster, manufacturing chemist and Tur dyer, for a certain process or processes b spent madder or madders that have been pr used can be made to yield a great quantity o ing matter, and for dyeing with the same colours all descriptions of cotton, linen, wo or any mixture of them, and also for impro dyeing madders that have not been previous Communicated by a foreigner residing abroa months; June 2, 1832.

William Hubie, of York, joiner and cabine for an improved mangle. Two months: Jun

Joseph Alexander Taylor, of George-stree over-square, Esq., for an improved whipstick to be used when riding. Two months; June

John Sylvester, of Great Russell-street, Mi engineer, for improvements in apparatus for the temperature of air to warm and ventilate ings. June 5.

Hugh Bolton, of Sharples, Bolton-le-Moo caster, carder, for an improvement in m used for carding cotton and other fibrous m Two months; June 5.

Jacob Perkins, of Fleet-street, London, engi certain improvements in blowing and exhaus applicable to various purposes. Six months;

George Lowe, of Brick-lane, Old-street, sex, civil engineer, for an invention for increa illuminating power of such coal-gas as is usu duced in gas-works; also for converting th products from the manufacture of coal-gas int ticle of commerce not heretofore produced; for a new mode of conducting the process of sation in the manufacture of gas for illuminat months; June 9.

William Brown, of Liverpool, merchant, f vention of certain improvements on steam Communicated by a foreigner residing abro months; June 9.

INTERIM NOTICES.

E. H. Yes.

Communications received from S. P.—Che Trebor Valentine—Mr. Henderson—Mr. B. W.

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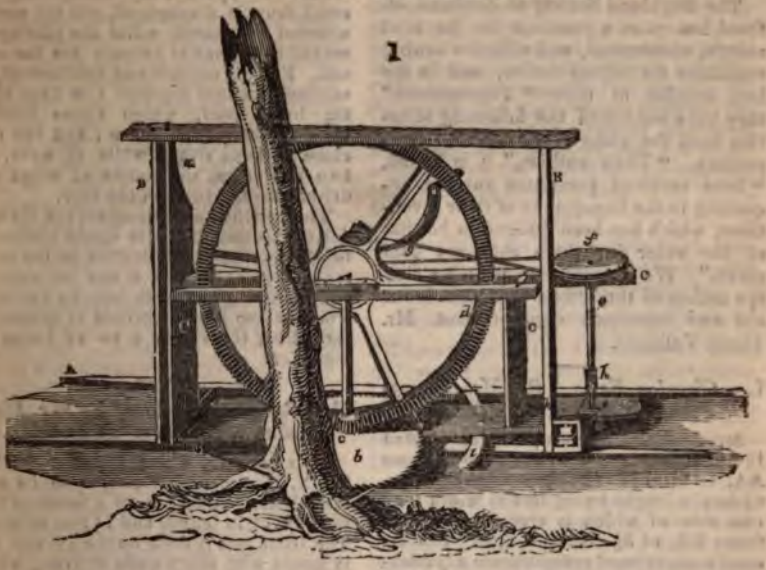
No. 464.] SATURDAY, JUNE 30, 1832. [Price 6d.

SAWING MACHINES FOR FELLING TIMBER.

1



2.

SAWING MACHINES FOR FELLING TIMBER.

The Highland Society of Scotland offered last year a premium for the most simple, economical, and effective sawing machines for felling timber, and in the last number of their "Transactions" they have published the following selection from the plans of the different competitors. "Their authors," it is stated, "have received premiums varying according to the importance of their inventions, which has been judged to be that of the order in which they are here given." We are glad to perceive that the author of the second best plan is our old and ingenious correspondent Mr. Dixon Vallance.

I.—*Circular Saw. By Mr. Thomas Jack, Westmill of Craigdallie.*

Mr. Jack's sawing machine, represented in fig. 1, consists, first, of a ground frame AA, in form of the common handbarrow, 8½ feet in length by 2½ feet in width; on one side of which is erected a vertical frame BB, of 3½ feet in height. The second compartment comprehends a traversing frame or carriage CC, about 5 feet in length, and 2 feet in height, the vertical bar *a* being prolonged upward, and having its top and bottom ends formed into pivots, on which the carriage is made to swing, carrying all the working machinery. The saw *b*, of 24 inches diameter, is fixed on the lower end of a vertical spindle, and immediately above it a bevelled pinion *c*, which is driven by the wheel *d*; the winch handle by which the power is applied, is fitted upon the same spindle. The saw pinion and the wheel *d* are in the proportion of 1 to 5, so that when the handle is turned with the ordinary velocity of 40 revolutions a minute, the saw will make 200 revolutions in the same time. In order to keep the edge of the saw in contact with the saw-draft, a vertical spindle *e*, carrying a pully *f*, of 1 foot diameter, is placed at the outward extremity of the carriage; the pully *f*, is put in motion by the band *g*, passing over a smaller pulley on the winch axle. On the spindle *e*, there is also fitted a small drum *h*, capable of being disengaged at pleasure from the motion of the spindle by means of a clutch. The cord *i*, which passes round the pully *k*, in the ground frame, has one end attached to the carriage; while the *other end being attached* to the drum is *coiled upon it when* revolving along with *the spindle, thereby* carrying forward the saw with a slow and uniform motion. When the operation is completed, the small drum is disengaged, and the cord is allowed to uncoil, while the carriage is moved backward to prepare for the next cut. For the support and guidance of the carriage, an iron segment *l* is fixed upon the lower part, which slides through eyes in the ground frame; and the machine is kept steady while at work, by two iron *dogs*, the hooks of which are driven into the roots of the tree.

The certificates accompanying the model of this machine bear ample testimony to its successful application on the large scale; and show that it can be worked, and carried from tree to tree, by two men. The machine here described is calculated for felling trees from 8 to 12 inches in diameter.

II.—*Reciprocating Saw. By Mr. Dixon Vallance, Libberton, Lanarkshire.*

This machine, which is represented in fig. 2, is remarkably simple in its construction. It consists of a frame of timber, 3 feet in length and 1½ feet in width. The front part A rests on the ground, and is armed with sharp studs of iron, which serve in part to attach it to the tree; the hind part B is supported upon and bolted to a cross timber C, which gives to the frame an inclination to the horizon of about 15°. This inclined plane is provided with grooves *a a*, in the side-bars of the frame, to which is adapted the square block *b*, carrying an iron stud or pivot. The saw *c* is in the form of a circular segment, 4½ feet in length, with a radius of curvature of abont 3 feet; it is distended in a moveable frame, formed of two radial bars *d d*, which meet at the pivot *e* of the sliding block, and are strongly connected with the lever *f*, by which the saw is worked. The saw-frame is further strengthened by a circular arc of iron, represented as crossing the inclined frame. The operation may be performed by the hand, either directly or through the medium of drag-ropes; and as the saw proceeds in the draft, it is impelled towards the tree partly by its own gravity, and partly by the operator pressing the saw forward. The merit of Mr. Vallance's machine lies in the extreme simplicity of its construction, and in the more advantageous position in which the operator exerts his force, as compared with the common saw. It has also been satisfactorily tried on the large scale, and seems on the whole to be an improvement on the common cross-cut saw, as applied to the felling of timber.

III.—*Circular Saw. By Mr. Alexander Gordon, Aberdeen.*

The frame-work of this machine consists of four arms, which cross at right angles, placed near the bottom, and a repetition of the same at the top of the frame-work; the two sets of arms being connected near their extremities by means of four upright pillars. In addition to these there are four auxiliary posts, so fitted with loop-holes, eyes, and screws, that they can be raised or let down, and fixed at any point, to suit inequalities of ground, and are in fact the feet on which the machine stands. A swinging jib, in the form of a St. Andrew's cross, carries the saw, which is put in motion by a combination of bevelled-geer, and a drum and pulley, acted upon by a winch handle. The operation of the machine is similar to that of Mr. Jack, though it is inferior in many respects. The mode of adjusting the feet to inequalities of ground, seems the chief point on which any superior merit rests, although the whole machine exhibits great ingenuity. This property of adjustment is exhibited in fig. 3, where *a* represents one of the four pillars of the frame-work, *b* part of an arm of the lower cross, *c* one of the upper arms, and *d* one of the four sliding legs. The eye or staple at *e*, and the loop-hole and pinching-nut at *f*, show the manner in which this can be effected.

IV.—*Reciprocating Saw. By Mr. Jas. Gibson, Kirkcaldy.*

Mr. Gibson's machine is the fourth in the order of the premiums voted by the Society. The reciprocating motion of the saw is produced by the action of a pair of bevelled wheels and a crank, put in motion by a winch handle, while the saw is sent forward by means of a screw worked by the hand of a man or a boy stationed for that purpose. The action of the saw seems to possess no peculiar merit, but the wheels used for transporting the machine are ingeniously adapted to perform the part of fly-wheels, when the saw is in operation. The method of obtaining this is in some degree represented in fig. 4, where *a a* is one end of the frame-work of the machine, *b b* one of the carriage-wheels, *c* the axle cut off, and *d e* a lever bar bearing the journal of the axle, jointed to the frame-work at *e*. A sword, *f*, passes through the moveable end of the lever, which is capable of being fixed at different heights by a pin passing through both. The motion of these parts admit *of the wheel* and axle *being raised or depressed in relation to* the frame-work, and *vice versa*; thereby putting the weight of the machine upon the bearing parts of the frame when the saw is at work, and upon the wheels when it is in the act of being transported. In the former case, the wheels are prevented from turning round on the axle by tightening the nut which secures the winch handles to the end of the axle, and, in the latter case, the nuts are slackened to allow the wheels to turn *upon* the axle, as in the common cart.

OBSERVATIONS ON "A PROFESSIONAL SURVEY OF THE OLD AND NEW LONDON BRIDGES, THEIR APPROACHES," &c.

Defence of the Works of the Dead.

The author of the "Professional Survey" will, I trust, excuse the observations I am about to make. There is great ability and a great deal of truth in what he has written—yet something more. He remarks, that

"The manner in which the old bridge was constructed reflects but little credit on the talents of the architect. The most obvious of its defects was the disproportionate size of the arches, and the extreme smallness of most of them; it had as many as nineteen, no two of which were alike, and some of them were higher at one side than the other."

It appears to me that Peter of Colechurch's great object in so constructing the bridge was the better to enable it to stem a powerful tide, and to support the weight of the chapel and houses afterwards erected on the bridge. There was very little occasion at that time for masted vessels, nearly all the goods from the country being landed above bridge, and those from abroad below bridge. Again, in the twelfth century, as England was in a very unsettled state, there might have been some policy in building a bridge not easily destroyed; and its strength is very apparent now that it is in the course of being pulled down, ill constructed as it is said to have been. In 1016, about a century and a half before this bridge was built, Canute's progress was impeded by the first wooden bridge, while only a few years earlier, Untlif the Dane sailed up the river without hindrance; and even so late as 1426, an invasion was provided against by a tower being built on the north side of the drawbridge, to give passage to ships to provision forces at Queenhithe.

Peter of Colechurch was well acquaint-

ed with the strength of the compost and rubble of Kent and Surrey, and he built the spandrils of the arches, and the body of the piers connected with them, as strong, if not stronger than the rocks from which he procured these materials; and I think that it will shortly be seen that he knew how to build a bridge between London and Southwark, as far as regarded the general utility of the navigation, and the convenience of the neighbouring inhabitants, its commerce, and the general good, quite as well as the people of the present time. Look at the immense expense incurred, and which must be incurred hereafter, without any return whatever! Peter, on the contrary, made a bridge which would itself pay for the building and repairs, by the rents of the houses on its back. No doubt he had also a view to the preservation of the property on the banks of the river, which would otherwise have been liable to great damage from its overflowing on a powerful wind and tide. On the removal of the old bridge this property will be ruined, unless other means are devised to protect it, which must be at a very great expense. Farther, the starlings are, in my opinion, peculiarly adapted to break the great bodies of ice which come floating down from the country in the winter time with an ebbing-tide. If this check be removed, neither boats nor barges will be able to move during severe frosts. Another great benefit was derived from these small arches, in their keeping up a head of water on an ebb-tide, thus enabling heavy-laden barges and vessels to get easier and earlier up the river.

The author of the "Survey" finds great fault with the foundations:—

"To the external defects of Peter of Colechurch's bridge are to be added some others of not less magnitude, which, an examination of its foundations, has brought to light. Like most bridges of the same antiquity, it was erected on stilts, that is, on piles driven into the bed of the river. Had these piles been sunk to a proper depth, and the masonry carried low enough, there might have been nothing improper in this mode of construction. But in Old London Bridge the piles appear to have been sawn off, generally at low water; they were then surrounded at a short distance by other rows of piles not so deeply imbedded (the starlings, as *they are called)*; and the space thus enclosed being filled in with stones, and loose rubbish, the piers were then carried up; which, to make matters worse, consisted merely of rubble-work, cased with an ashlaring of stone. Neither was the piling itself of the best description. The piles are described as being rough, round, and unhewn; and though shod with iron, and driven close, not connected with capciles, or any other contrivance. The piers being thus, at once weak in themselves and weakly supported, were but ill calculated to sustain the thrust of the arches; and hence in the progress of time, the necessity for fresh casings of stone, in front of the original ashlar, and for fresh starlings to protect the stone from the action of the river. In consequence, moreover, of the great contraction of the water-way, caused by the extent of these starlings, the impeded and swollen waters rushed through the arches with such velocity, that to prevent the bed of the river being torn away, through the violence of the current, it was found necessary to adopt the farther expedient of binding it together by what are technically called *drip-shot piles*, that is, piles driven in irregularly, and with their heads so low in the water as to offer no obstacle to the navigation. Notwithstanding all the props and stays applied to this ill-built structure, eighty years had not elapsed, from the time of its erection, when it was in a state of complete ruin."

Now, it is certain, that with some repairs, it stood 457 years after it was finished, which, one would have thought, it could scarcely have done had it been such a rubbishing concern as is here represented. This period of 457 years reached 1666, the year of the great fire of London, when the houses upon the bridge were nearly all destroyed, and the piers and arches much damaged. The bridge at this time was repaired, and the houses rebuilt four stories high. Now, must not the then Corporation have been mad (if the present Corporation be in the right), to load so badly constructed a bridge, after 457 years' wear and tear, with such a ponderous weight for 99 or even 61 years? Why, they ought to have been immediately prosecuted by the Crown for putting in jeopardy the lives of the King's subjects. The result, however, proved, that they were not bad judges, for it stood 90 years out of the 99; whereas, had the statement of its bad construction been true, it must in that time have fallen to pieces.

The writer then goes on to s
"in 1754, the bridge was once

so dilapidated a state, and presented, with its overhanging masses of bricks and mortar, so unsightly a contrast to the open and spacious new bridge which had just been erected at Westminster, that it came to be seriously debated in the Corporation, whether it would not be expedient to pull it down altogether." Scientific gentlemen were consulted upon the soundness of the bridge, and the result of their deliberations was a report that the bridge *was perfectly sound;* and that by clearing away the houses, and making a few alterations and repairs in the piers and arches, the edifice might be rendered, for ages to come, quite as serviceable, if not as elegant, as that of Westminster. An act of parliament was accordingly soon after (1756) obtained, empowering the Corporation to purchase and remove the houses. This proceeding was, I think, very judicious; population and trade had increased, and a wider way was therefore found necessary: but as far as regarded the strength of the foundation, the houses might have stood to this day, with ordinary repairs, and taking care to keep up the bed of the river round it.

It is next stated, that after "clearing away the buildings which had so long encumbered and disfigured the surface of the bridge," they proceeded to make open a waterway in the centre by the conversion of two arches into one large arch. Now, as this must have doubled the thrust on these *badly* constructed piers and starlings, was it not a bold adventure?

After some very just observations as to the unnecessary expense attending the alteration of this arch, the writer proceeds to say, that the bridge was considered so stable as to give a promise of very long duration, but that the waterway was still too contracted—that before another half century had elapsed rumours of its being again in a fearful state of decay got abroad—that a general desire was expressed for a new bridge—and that in 1823 an act of parliament was passed for that purpose, and for making suitable approaches. In the preamble of this act, the reason assigned [illegible] down the old bridge [illegible] fall of water [illegible] occasioned [illegible] piers, re[illegible] to the [illegible]

jesty's subjects." The "Survey" shows, from the evidence produced upon the subject, that the fall was not occasioned by the piers damming up the water, but by the unevenness of the bed of the river. The celebrated Smeaton, who reported on the state of the bridge, was of opinion, that the fall might be occasioned by the sullage of the river gathering from time to time. If this be the case, how is it that although immense quantities of stone are thrown into the river under the new bridge, no material fall is occasioned there? This is done, I have heard, to protect the foundation of the bridge; but sullage being merely a mass of matter which falls to the bottom, and remains almost undisturbed by the current, particularly at the base, I do not see how it can afford any protection to the foundations of the piers.

The "Survey" further states, that all the damage occasioned by the bridge in twenty years amounted to 18 lives lost, and £4000 worth of property destroyed; much of which loss was caused by inebriety and wantonness. Then comes the most important statement, that the old bridge might have been so altered and repaired for about £100,000, as to have answered all necessary purposes. In my opinion, this should have been the course adopted. The writer states, that Mr. Dance and Mr. Chapman (in 1821) gave their opinion that the piers and starlings were quite sound; and that at a still later period, Mr. Walker, the builder of Vauxhall Bridge, reported that "new arches might be made as secure upon the present piers and starlings, as the foundation of any new bridge." We are farther informed, that Mr. Smeaton reported that "if London Bridge were taken away, the river would become so shallow above bridge, at low-water, that the navigation would be greatly impeded for hours each tide;" but that Mr. Telford also showed

"'1. That, were the old bridge removed, the velocity of the ebb above bridge would materially increase, and the time of low water be earlier than at present. 2. That the navigation, which is now practicable up to Teddington, would cease too early near that place. 3. That the bed of the river would be left nearly dry for several hours in the latter part of the ebb. 4. That though these evils would in part be remedied by the increased velocity and momentum scouring away the

mud, sand, and small gravel, so as to deepen the bed; yet, that this lowering the bed would 'seriously affect' the foundations of some of the other bridges, those of Blackfriars, Waterloo, and Westminster, in particular; cause settlements in the wharfs and houses on the banks of the river; walls to be undermined, &c. And, 5. That all the river above bridge, all the banks and low grounds on each side, from Westminster to Teddington, will, when the dam is removed, be more liable to be overflowed by high tides.'"

Now, how are we to account for the difference of opinion between these two scientific gentlemen, Mr. Smeaton and Mr. Telford, on this one point? If a strong current, and heavy body of water, will scour in one part of the river, why not in another? If there be a stoppage at London Bridge by the sullage, where there is a body of water of from 30 to 44 feet deep, and a strong current, how is it that a scouring is likely to occur at Teddington, with so much less water and current?

I must now advert to the reason for building this bridge, inscribed on the plate deposited in the excavation of the first stone. The inscription says:—

"The *free course of the river being obstructed by the numerous piers* of the ancient bridge, and the passage of boats and vessels through its narrow channels being often attended with *danger and loss of life*, by reason of the *force and rapidity of the current*; the City of London, desirous of providing a remedy for this evil, and, at the same time, *consulting the convenience of commerce* (?) in this vast emporium of all nations, under the sanction, and with the liberal aid, of Parliament, resolved to erect a bridge upon a foundation altogether new, with arches of wider span, and of a character corresponding to the dignity and importance of this royal city, &c."

Now, these may be very good reasons to those who have never considered the practical utility of this great work of Peter of Colechurch; but are we to suppose it possible, that a man of such eminence—no doubt considered the first architect in his day—would have so committed himself, as, without any reason, to dam up the river, to the disadvantage of his fellow-citizens? Surely there were wise men in those days who would have been consulted concerning the building of this bridge, and as to its effect upon the *commerce* and convenience of the city.

I am writing this on a very foggy evening, and it occurs to me that con might be erected over the cent of the new bridge, opposite the where the chapel stood—which is have contained the remains of P Colechurch—in honour of his m and for the safety of vessels in a fog, when the lamps could not be s

I shall, lastly, speak as regards t lities of Mr. Rennie, the elder, who ed, and of Mr. Rennie the young conducted the building of the new The faults I am about to find I lay to their charge: they have d a bridge, and it has been built ac to their plan—the variations in si the additional expense being san by Parliament and the Corporatio bridge is certainly, to the eye, piece of architecture, and, from appearances, well put together. I is not all that is required in such For my part, I disapprove of its el its parapet or guide-walls, a Tooley-street approaches. Had the had two more arches, its elevation have been much less, and yet qui cient for the navigation. And as ject of the approaches was to equal ascent, if there had been less el this would have been effected wit less trouble and expense, and th tional piers would also have se keep up some head of water. would not have been occasion down so many buildings, which have afforded shelter to the bridg the wind, which recoils against th parapet, and almost blinds the passing. This would not have be case with open balustrades, which have given free course to the wind foot-ways of the bridge will be muddy in wet weather. The seats in the recesses of the bridge ar calculated for footstools for the s stature, than for resting-places lame and infirm. The descent Surrey side of the bridge is so shar the gravity of the load very ofte powers the horse. Some time this place, I saw a fine animal h shoulder broken, which rendered cessary that it should be killed spot; others, I have been told, not able to stop, have been forced Tooley-street against St. Olave's —any one passing at this time wo all probability, have been knocke

and perhaps killed. Had the altitude of the bridge been less, and the road wider, the ascent and descent would have been proportionably less, and the approaches generally better, and would have been completed at much less expense. With attention to economy, Fish-street-hill, and Lower and Upper Thames streets, might have been altered for about £50,000, and at the same time the public better accommodated. I have no doubt the citizens, by this time, are convinced of their error, but it is too late to mend.

OBSERVER.

ENGLISH AND AMERICAN SETTLERS.

Sir,—In the article headed "Books for Emigrants," No. 460, there is an admirable account of the persevering exertions of a Mr. Philemon Wright, as a settler in Canada, and the success which he eventually ensured. He is only one of many similar instances which could be pointed out. The perseverance of the people of the Eastern States of the Union in all their undertakings is indeed remarkable, and especially in settling in a new country—still more so when contrasted with the natives of Europe, putting even Scotch vigilance in the back ground.

Basil Hall affects to consider the Canadians superior, and says that he went into raptures the moment he crossed the border, at the difference. For his taste I cannot answer, but assuredly, though there is a great difference, it is all in favour of the people of the Union. Whenever a newly settled farm is better managed than ordinary in Canada, it may be predicted almost to a certainty that the owner is an emigrant from New England.

"As Jonathan his work does with less trouble,
It follows, he has more time left for neatness;
While Europe's sons progress with labour double,
And scarce can taste domestic comfort's sweetness.
A slight cross serves to fix them in a hobble,
And then they fail in a resource of meetness.
Thus Canada must still be far behind
The States, in shrewdness, and 'the march of mind.'"

"For mind and drudgery rarely march together."

Tale of Tucuman.

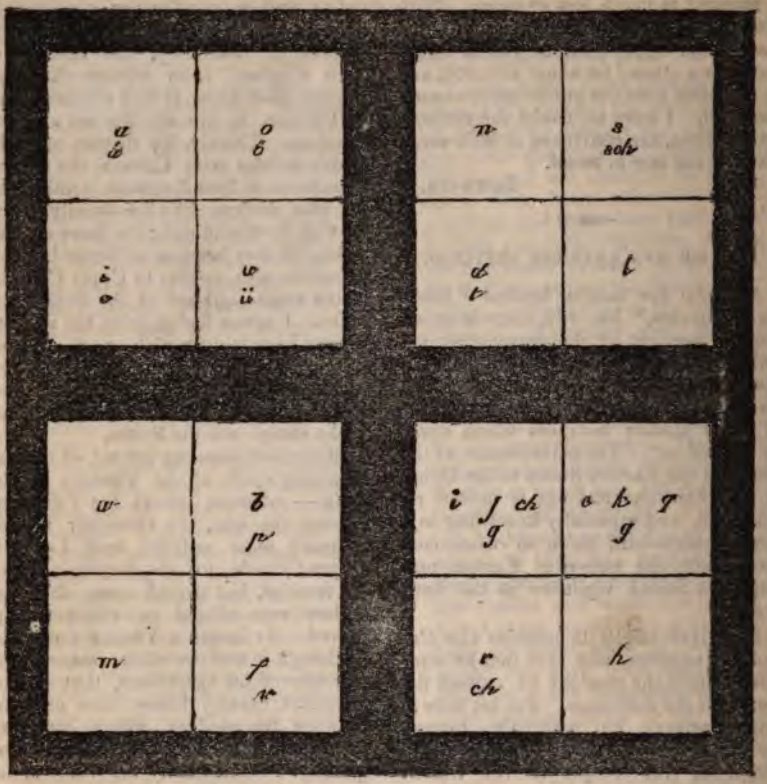
It may seem strange that people should emigrate *from the States* to Canada, while there is so much rich land throughout the Union, but there are reasons for it. In the first place, the land in Canada is given away, whereas the government of the Union charges one dollar and a quarter per acre for it. This to an economic Yankee is a consideration. Secondly, the climate of New England, from whence the emigration takes place, is very similar to that of Canada, as are also the soil and productions. Thirdly, the district of Ohio, which divides with Canada the surplus population of New England, is unhealthy for new settlers, who are usually afflicted with fever and ague for three or four years, till they become acclimated. This objection also applies to Upper Canada, in the neighbourhood of the fresh water lakes. I speak feelingly on the subject, having been laid up with an attack, from which I was cured by a sort of half-desperate cold shower-bath under the great fall of Niagara, and thence making my lucky escape into the States.

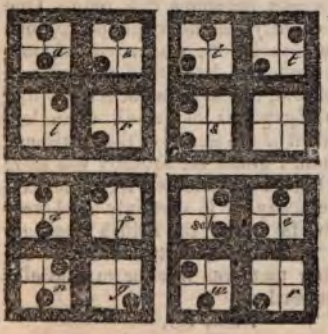
Many anecdotes are related of the enterprising spirit of the Yankees in Canada — amongst others the following. During the war, the Governor wanted to move some artillery from Lower to Upper Canada, for the fortifications on the frontier, but though many thousand dollars were offered no contractor appeared. At length a Yankee undertook it, though it was the winter season, and so contrived his agreement, that the government cavalry horses were used for drawing the sledges, which contained the guns, over the snow. He, consequently, cleared nearly the whole of his payment by the job, and in the space of a few weeks became a rich man. One of his countrymen, after the peace, took him to task for it; when, with characteristic acuteness, he replied, "Why, you d——d fool, Mister! was'nt it a spoiling of the Egyptians to get all them 'ere dollars out of the hands of the Britishers, and then, I guess, the artillery was more handy like on the frontier, for uncle Sam to take away." It certainly said very little in favour of the British "belligerents" in Canada, that their joint engineering tact was inferior to that of a Yankee settler.

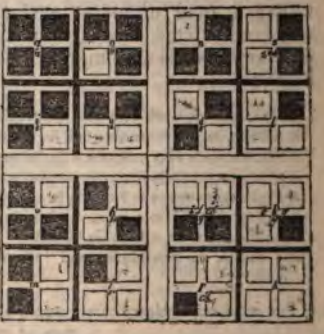
I am, Sir,
Yours, truly,
JUNIUS REDIVIVUS.

DESCRIPTION OF A MACHINE FOR WRITING WITH DISPATCH, INVENTED BY BARON DE DRAIS.

(Communicated by the Inventor.)







In the above Engravings the German alphabet has been followed; but any other may of course be readily substituted.

The object of this invention is to transfer to paper with greater rapidity than can be done by the pen, or by any other means yet invented, words either spoken or written. One machine has been already completed, and shown, in successful operation, to a number of scientific gentlemen. It consists in its exterior of a small wooden box of the size and shape of a cubic foot. In the centre of its surface, is an opening in which there are places for four times four square keys, each of which being pressed downwards similar to the keys of a piano, will be found to make signs for one or more of 16 letters, to which number the alphabet is, for the purposes of this machine, abridged. In order to make character by character, or letter by letter, the writer, seated with the machine on some low table (or on a stool between his legs, constructed for the purpose) needs but lightly press down in due order the keys which represent these letters; which keys act upon machinery within the box, by means of which the writing is produced.

By this easy method a great facility may be attained, especially by possessing the dexterity of an able player on the pianoforte, as instead of making flourished letters, it is only necessary, as it were, to make small marks. To arrive at perfection, it is necessary that this abridged alphabet be well understood and known, so that a performer may be able to strike down those keys, which represent any letter immediately, and with the utmost precision. The accompanying plan is to be well studied; the black squares signify those keys that are to be pressed down, and the white ones those which are to remain. Pressing all four keys down, you represent the letter A, the first three only, the letter I, the last alone the letter K, and by touching none signifies either an H, or the conclusion of the word or syllable. For this reason the machine is so constructed, that immediately after the pressing upon the keys, the paper, by revolving, leaves four places empty, designed for the reception of four letters. For instance, to express the words, "Every beginning is difficult," it is only necessary to make four strokes in as quick succession as possible, as will be seen by the plan; so that by this means it is possible to write faster than the quickest speaker can speak. The inventor exhibited his machine to the Frankfort General Assembly for promoting the Useful Arts in September last; and the result, as will be seen from the following extract from the General Post Gazette of Frankfort, of the 18th of September, was in the highest degree satisfactory.

Extract:

"Although distances are constantly shortening by canals, rail-roads, &c., bringing mankind nearer to each other, as if the surface of the globe had been contracted; and although steam printing presses have contributed to the more general diffusion of improved methods in the arts and sciences—yet one invention of great importance to society was still wanting, that which should commit speech to paper, by marks or signs, in all the freshness and brilliancy of its first conception, and in all the freedom and lively developement of its first utterance. At the last Meeting of the General Assembly at Frankfort for the promotion of the Useful Arts, Baron de Drais, original inventor of the Velocipede, exhibited a machine, by which, when practice is once attained, words can be committed to paper, by means of signs, in a method resembling playing on the piano. The Members of the Society present unanimously declared themselves to be perfectly satisfied of the success of this most ingenious invention. Baron de Drais intends taking his machine to England—the country where the arts, sciences, and freedom of speech exist in their greatest lustre, and from whence we shall probably hear more of the application of this invention, which is but in its infancy as respects many matters of the highest importance to society."

C. D.

[We have seen Baron Drais write by his machine, which is undoubtedly very ingenious; but we think that a degree of pains has been taken to make it difficult of use, which might well have been spared. As it is, it can produce a description of short-hand writing only, and could scarcely work with greater expedition than short-hand writers do already; besides, however quickly it might work, it must needs exclude all selection and discrimination, which are quite as necessary ingredients in the character of a good stenographist as quickness of hand. If the machine, however, can write short hand, it might, if simplified, write any thing; and such a simplifi-

cation of it, we would recommend Baron Drais to enter upon forthwith. A copying machine on this plan—to copy writings merely without any abridgement—*would* be a thing of real utility; especially if more than one copy could be produced at a time, which (if *one* can be produced) might, we think, be easily managed.—Ed. M. M.]

SWEATING, OR CHOLERA BEDS.

Sir,—Medical gentlemen are, I believe, agreed, that when a person is attacked with spasmodic cholera the sooner heat is applied to the body, the more chance there is for recovery; with this view the Spirit Air Bath was improved, and brought more generally into notice. I wish, however, to give early publicity to an apparatus which I have contrived for the same purpose, and should you think it likely to be useful I shall be glad if you will lay a description of it before your readers.

Provide a tin hollow case of equal dimensions with the area of the space *within* the bed-stocks; let this case be everywhere flat except at the top which must be slightly concave in the direction across the bed; let it be two inches deep at the edge and fix it *underneath* and *close to* the cording of the bed.

Let one or two brass nuts be soldered into that edge of the case which faces the room or fire-place, and one in the bottom. Prepare copper piping to screw into the nut at the edge of the case and provide it with a stop-cock—let this piping reach from the bed to the middle of the room,* or to the fire-place, which is better, or it may be carried through the floor, by the wall side, to any kitchen fire below stairs; prepare also a short length of piping to screw into the nut at the *bottom* of the case, and when in use, let the end next the floor be inserted in a washing bowl half-filled with cold water.

Take a common tea-kettle, iron pan, or boiler, make the lid to bolt or screw on, and solder into it two brass nuts, screwed inside, and a small safety-valve; prepare a small tunnel with a pipe or shank long enough to reach from the bottom of the inverted cone part to nearly the bottom of the boiler; upon the surface, an the top of this pipe, have a screw into one of the holes in the lid kettle or boiler, to which this tunn then act as a feeder. When this is in common use, the two holes lid may be stopped with brass n ting the female screws.

I will now explain more partic the use of the above apparatus.

When a bed so fitted up is requ be used for a medical purpose, to the sacking or cording a thin or flock bed only, and no mattrass; the end of the pipe where the sto is, into the edge of the tin case, a other end into the top of the bo kettle, containing boiling wate placed on a good fire—see, also, th tunnel or feed pipe is screwed in other hole. The steam will the from the surface of the water boiler, take the direction of th leading to the tin case, and heat few moments, which heat will ver be communicated through the bed body of the patient. The quan heat may always be regulated stop cock.

In conclusion, I offer the foll observations:—

1.—Heat, by the above metho be quickly and generally distr throughout the bed, which, in c is a matter of great importance.

2.—By having hollow sockets n edge of the heated tin case, the *of any spirit* may be easily made round the edge of the bed-stocks i bed, and upon the patient if necess

3.—The bed is equally useful fo nary purposes with a tin case as w one, and might occasionally be u the cure of other diseases besides c

4.—Infirmaries, dispensaries, a vate houses, may easily have *one* o beds constructed on this principl one boiler, if necessary, would them *all* with steam at the same t

5.—Should cholera be very pre in any town, a few of these sweat cholera beds may be kept ready in each district.

I am, Sir,

Yours, respectfully,

E. J. Mitch

Bradford, Yorkshire,
June 19, 1832.

* In this case, a chafing dish containing heated cinders or charcoal must be used to generate the *steam*.

THE LADYE CHAPEL.

On Thursday, the 20th instant, a performance of Sacred Music took place in the venerable Church of St. Saviour's, Southwark, in aid of the funds raising towards the restoration of the ancient and beautiful Ladye Chapel, which has been suffered to fall into a shameful state of decay. The company was most numerous; indeed it could scarcely be otherwise—the singers were of the first rank in their profession, and the selection of music excellent—a combination of attractions not to be resisted by the lovers of sweet sounds and the admirers of skilful artists.

On the 4th and 5th of July a Fancy Fair in aid of the same praiseworthy object will be held in the Surrey Zoological Gardens. This is the ladies' scheme; of course the "Fair" will be not only numerously attended, but abundantly productive; for a love of the fine arts and the well-known gallantry of Englishmen will combine to render it a source of wealth, to the subscription for the rescue of the Ladye Chapel. Miss Gwilt, daughter of the enthusiastic and talented architect of that name, is the Secretary, and to her all contributions may be forwarded and will be thankfully received.

If any one requires an inducement to prompt him to support this subscription, only let him take a walk over London Bridge; he will then, if he have the least taste for architectural beauty, see quite enough to resolve to be at the fair with full pockets and a giving mind, and to induce him to hope continually that the 4th and 5th of next month may be days of unclouded sunshine.

T. M. B.

MESSAGE FROM THE FAIRIES.

Sir,—My mischievous messenger, Puck, told me,

> "I'll put a girdle round about the earth
> "In forty minutes."

It may surprise the unbelieving world to know that he performed the feat! We fairies are a race who neither sow nor reap; we calculate not, neither do we hold high arguments; our hours are spent in mirth and song and jollity, and in bestowing unseen favours on the sons of earth. It will, therefore, be conferring a favour on our aerial race, if any of your *friends would solve for us* a question which has caused in my kingdom as much contention as the strife I held with Titania for the "changeling boy." It is this:—How many miles per second did Puck move at, going against the direction in which the great globe moves, and *vice versa?* It will be observed, that on the first road he has a strong current of air to oppose him, and on the second he is holpen forward.

We have been much amused by your writer T. If he gives me a solution, Puck shall not teaze him for twelve moons to come, and he shall disenchant him on the subject of Lieut. Drummond's principle of representation. With my highest assurances of profound respects,

I am,
Very spiritually yours,
OBERON.

Ambersbad, June 16, 1832.

MR. MURRAY'S PLAN OF ESCAPE FROM FIRE.

Sir,—I appreciate very highly your friendly and favourable notice of the modified application of my method for saving from shipwreck, to serve as a medium of escape from fire; and the necessity of which, the recent catastrophe in Oxford Street, so forcibly illustrates.

Your interesting remarks refer to what has been lately adopted in Edinburgh, and if I understand the merits of the question aright, a cross bow propels the arrow. This was among the first methods I had suggested, which may be seen, if I mistake not, by referring to the early pages of the Edinburgh Philosophical Journal, then supported by the co-editorship of Dr. Brewster and Professor Jameson. This method was followed by simplified arrangements on the principles of the balista and catapulta of the ancients; but I abandoned the cross-bow at once, because its practicability in a gale of wind seemed altogether problematical.

I must confess that I at least cannot conceive of simpler means of escape from fire, than by a rope projected by the method proposed. It is necessary to observe that the rope should be smeared over with *two distinct layers* of earthy matter, such as *pipe clay*, in order to resist the impression of fire, and aluminous earth is a good non-conductor—perhaps

enhanced by an admixture of sand. In a recent letter to the "Times" newspaper, I have endeavoured to describe a simple arrangement of the rope fire-escape. A solitary extended rope is all that is required; a transverse bar of wood slides easily up and down through a central eye (or hose, to secure its steadiness more effectually) and this is raised and lowered on the main rope, by a smaller one threaded through a pully connected with a fixed block. Those who escape may easily sustain themselves in a sitting posture, astride and holding fast by a sliding hose, running on the rope, and raised to the required position along with the elevation of the transverse bar; nor would the conversion of this bar into a cradle of wicker-work materially detract from the advantages secured by its extreme simplicity.

In a letter to the editor of the "United Service Journal," I have replied to the question of the loss of life on the coast of Cornwall, in the winter of 1830. My information was received from the common source of intelligence, namely, the public journals. The statement remained unquestioned, and I only accepted it as notorious and uncontroverted, when it had long traversed these channels without any attempt at contradiction. and numerous truly, were the newspapers that repeated the assertion. After all, it can only be partially erroneous, for the anonymous writer admits that many vessels were lost; the wrecks of which were total, and the crews of them entirely perished. He confesses he does not know how many, and it is quite possible that he who communicated the former intelligence, might justly lay claim to all the merits of numerical precision. The *onus* of reply rests not with me, since I merely echoed what seemed to be the public voice.

There, cannot, I think, sir, be required a more simple and interesting illustration of the efficacy and success of the plan I have proposed, for saving lives from shipwreck, than what occurred in the recent storm off the island of St. Vincent. All endeavours to approach the vessel in the offing, had proved unavailing, and in a few hours the wreck would have been complete. "A SLAVE" from an adjoining estate, contrived to fasten a line to a stone, and cast it on board by means of a *sling. A rope connected* with it, was thus easily drawn on board, and a line of communication established with the shore, "and so it was that all escaped to land."

Sincerely thanking you for your friendly endeavours in directing public attention to the means proposed,

I remain, respectfully, Sir,

Your obliged obedient servant,

J. MURRAY.

20th June, 1832.

P.S.—A complete set of my apparatus for saving from shipwreck, has been provided for the port of Whitby, by some spirited individuals of that town, and a series of preparatory experiments gave the utmost satisfaction to the concourse of people who witnessed them.—J. M.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Second Annual Meeting. *

It will be in the recollection of our readers, that the second meeting of this Association, was appointed to be held at Oxford, on the 18th of June, of the present year. In pursuance of this resolution, many distinguished cultivators and admirers of science, met in that place at the time appointed.

In the course of Monday, a considerable number of new members were admitted. It was agreed that the Association should meet in four sections, corresponding to different branches of science; and the following divisions were the result:—

1. *Mathematics, General Physics, and Mechanical arts.* Professors Airy, and Babbage; Sir D. Brewster; Mr. Brunel; Sir T. Brisbane; Rev. H. Coddington; Mr. J. D. Forbes; Mr. Davies Gilbert; Mr. Creswell; Professor Hamilton; Mr. Harvey; Professor Jarrett; Mr. Murphy; Dr. Pearson; Professor Powell; Mr. Potter; Professor Rigaud; Mr. Rothman; Captain Smyth; Rev. R. Willis; Rev. W. Walker; Rev. W. Whewell.

2. *Chemistry, Mineralogy, and Chemical Arts.* Mr. Dalton; Dr. Daubeny; Mr. Children; Professor Cumming; Mr. Faraday; Mr. Johnston; Dr. Prout;

* For this Report, we are chiefly indebted to the Oxford Journal.

Dr. Turner; Rev. W. V. Harcourt; Mr. Harris; Professor Ritchie; Mr. Scoresby; Dr. Gregory; Mr. Konig; Mr. Brookes; Professor Miller; Marquis of Northampton; Mr. Guillemard.

3. *Geology and Geography.* Rev. W. Buckland, D.D.; Rev. W. Conybeare; Rev. A. Sedgwick, Mr. R. J. Murchison; Mr. G. B. Greenough; W. H. Fitton, M.D.; Rev. W. V. Harcourt; The Marquis of Northampton; Major-General Straton; Viscount Cole; Sir Philip Egerton, Bart.; Mr. W. Smith; Dr. Edward Turner; Mr. Henry Witham; Thomas England, Esq.; Sir C. Lemon, Bart.; Mr. W. Hutton; Mr. W. Clift; Mr. John Taylor; Rev. J. Yates; Mr. G. Mantell; Sir T. D. Acland, Bart; Mr. J. Carne.

4. *Natural History.*—Mr. R. Brown; Dr. Daubeny; Professor Henslow; Dr. Williams; Mr. R. Taylor; Mr. Jenyns; Mr. Garnons; Mr. P. Duncan; Mr. Yarrell; Mr. Vigers; Mr. Sabine; Dr. Pritchard; Mr. Clift; Dr. Kidd; Dr. Knox; Mr. Burchell.

The general meetings were held, with the permission of the University, in the Sheldonian Theatre, and the sectional meetings, and other business, were transacted in the rooms in the Clarendon Buildings.

On Tuesday the sectional committees chose the following officers:—

Physics, &c.—President, Mr. D. Gilbert. Secretary, Rev. H. Coddington.

Chemistry, &c. — President, Mr. J. Dalton. Secretary, Mr. Johnston.

Geology, &c.—President, Mr. Murchison. Secretary, Mr. J. Taylor.

Natural History, &c.—President, Mr. P. Duncan. Secretary, Professor Henslow.

On Tuesday, at one o'clock, Lord Milton, the President of the Association, at its former meeting, took the chair, and opened the general business, in a speech to the following effect:—

Gentlemen.—Sensible as I was of my insufficiency, when called upon to preside over the first meeting of this Association, and which I attributed rather to accident, than to any merit of my own—how much more must I feel the difficulty of my situation, in being called upon to address you in the place, in which are transacted the most important concerns of this great University. The difficulty, however, *is much lightened* by the considerations, that my almost only duty is to resign the office into hands more competent to wield it; and that I am addressing an audience, upon whom it is unnecessary even to endeavour to impress the importance of Associations, which have for their object, to extend the bounds of human knowledge, and give man a larger empire over nature. I, in common with the other members of the society, express my gratitude to the authorities of this University, for the kindness with which they have received us on the present occasion; and I trust they will never have occasion to repent their kindness, when they reflect that the great aim of the society, is to promote all those higher objects in which man has the greatest interest. The object to which we are ultimately to look, is to enable and induce mankind to lift up his heart to his Creator, and by comparing the inability of the creature with the stupendous powers of the Creator, add to those feelings of awe, duty, and reverence which we owe to the wisdom, power, and beneficence of the Creator. The university can never repent of having introduced within its walls, an Association, the object of which is to enlarge the bounds of human knowledge, and to extend that empire, which, by the Creator himself, we have been invested with, over the works of God himself."

The Rev. Dr. Buckland having taken the chair, as President of the present annual meeting, addressed the Assembly as follows:—

My Lords and Gentlemen.—I cannot enter on the office in which I am placed, without acknowledging the undeserved compliment my noble predecessor has paid me. With respect to the objects of the institution, I think it needless to occupy your time by attempting to convince you of its utility or necessity. If one single argument were necessary to prove its utility—if but the shadow of a doubt remained on the mind of one present, I would answer that doubt in one word, "*circumspice.*" Your presence, gentlemen, is a full sanction of the proceedings of last year. Therefore I will proceed to state the order of business which the committee recommend to be adopted."

The Reverend President then stated the order in which the business would proceed.

Professor Airy then read his report on

the state and progress of Practical and Physical Astronomy, undertaken in pursuance of the request of the former meeting.

Mr. Lubbock's report on the present state of our knowledge respecting the tides, was the next in order, and in the absence of the author, its substance was stated by the Rev. W. Whewell, and illustrated by a map of the world, in which were drawn the cotidal lines, or lines which pass through all the points where it is high water at the same moment.

The meeting then adjourned to the hall of the new college to dinner. After the health of the King and Queen had been drank, the President, in proposing the "Vice Chancellor, and Governors of the University," expressed the gratitude of himself and the other members of the Society, for the accommodation which had been afforded them to transact the important business in which they were engaged. He stated that Lord Grenville, the Chancellor of the University, had enrolled himself a member, and had by all possible means advanced the object of the meeting.

The *Vice Chancellor*, in returning thanks, invited the members of the Association to breakfast on the following morning, at nine o'clock.

The President then expressed his gratitude to the Wardens and Fellows of the New College, and said that though it would almost be invidious, he might say impossible, to mention the name of any single person, to whom more than another, a debt of gratitude was due; yet there were two individuals whom it was his peculiar duty to select. Need he mention the name of Duncan? Brothers in literature—brothers in arts—brothers in every charity and virtue which could adorn human nature—and brothers also, with every one present, in endeavouring to promote the cause of science and literature.

Mr. Duncan in returning thanks said, that nothing could tend more to the advancement of science than an Association like the present, which, by bringing into contact, minds of various talents, and of various pursuits, reflecting and reciprocating light on various subjects, would doubtless be the means of stimulating and accumulating a great accession of various knowledge. The meeting at present assembled, was most accordant with the genius of the place. Long might the stream of science flow through the land, and fertilize it with its tributary waters!" "*Floreat Societas nostra: esto perpetua.*"

The *Warden* also returned thanks—after which "Dulce Domum" was sung by the choir.

The *President* said that the harmony they had just heard, accorded most delightfully with that harmony which he trusted would ever accompany the toast which he was anxious to propose—"The British Association for the promotion of Science." Nearly two centuries had elapsed since the parent of our philosophical societies, the Royal Society of London, received its earliest nurture within the walls of this University. It was here, the infant Royal Society first held its sittings. That society had now a numerous offspring, and this Association must be reckoned as the youngest of its children. He knew that all present felt the deepest interest in the welfare of the Association, and it was their duty to acknowledge the obligations they were under to the late President. He begged to propose—"Prosperity to the British Association for the Promotion of Science, and its late President, Lord Milton."

Lord Milton in the course of returning thanks, said:—Delightful were those feelings which were generated by science, great indeed were the treasures they imparted to the human mind; they were such as made it most desirable that every man, in the situation he filled, might be enabled to enjoy them to the utmost of his capacity. Considered, however, in that light alone—merely for the purpose of procuring the gratification of man—science was nothing as compared with the other great object he had ventured to suggest. Even in this august presence, within the walls of this university, when he was called on to take his humble share in this effort, for the promotion of science, his great gratification in joining it was—not only that it tended to humanize the mind, not only that it tended to give pleasure to those who could lift themselves up to its enjoyments, but that it tended above all things, to give us more enlarged notions of the power of the Creator, still more of his wisdom,

and above all of his beneficence. His lordship then proposed the health of the President, the Rev. Dr. Buckland.

The *President* returned thanks. As far as his humble abilities could in any way enable him to farther the objects of the Association, they should be exercised for its advancement. The members of the Association were aware of the phalanx of scientific individuals with whose presence they were favoured. When they saw the names which were enlisted in the service of the Association, there could not be a doubt of the conquests which were likely to be achieved in the cause of Science. He then proposed the health of Mr. Whewell, one of the Vice-Presidents, who had been actively engaged with the reports on science. He mentioned, that besides the reports, which had been provided expressly at the request of the Association, there were fifty other communications which would come before the meeting.

Mr. Whewell acknowledged the honour done to the authors of the reports by the manner in which they had been noticed. He conceived that between the small band of really great names in science—the distinguished few—the discoverers of new laws and truths, and the wide circle of general readers—there must stand an intermediate class, engaged in the task of receiving these new truths, on the one side, and of presenting them, on the other, in such a form as to enable readers at large to apprehend their scope and bearing, their relation to what was before known, and the prospects they opened to the future. He deemed this, though far below the glory of original discovery, to be a grateful and useful office; because it diffused the elevation of thought, which the lofty views of philosophy were calculated to inspire, to many of those who could not hope to understand the details or the grounds of the knowledge from which this feeling emanated. He thought also that such views of science were fitted to excite feelings the very opposite to that childish and foolish contempt of those who have gone before us, and who therefore have known less than we know, which a smattering in modern science sometimes produces; for they would show by what pains and perseverance, by what alternations of struggles and failures, of hopes and disappointments, every advance in science must be made. Such would be the use of reports like those now offered to the Association, were they made by common men; but when, as was the case with some in the list now referred to, the discoverers themselves did not refuse to give such notice of the tendency of their labours, he undoubtedly conceived that the British Association, and the world at large, were gainers by the plan which had led to the production of these Memoirs.

The *President*, in proposing the Royal Society of London, and the Vice-President, Mr. Davies Gilbert, said, that it had been supposed that the objects of the British Association would interfere with the Royal Society; but there was no ground for any such apprehension. So far from their being any danger to be apprenended from an increase of such Societies, the danger was rather that, of their being overwhelmed with subjects for investigation.

Mr. Davies Gilbert said, that such a concentration of science had never before been collected together in any country, and he hoped Oxford would never cease to be one of the lights of the civilized world. He had been for 47 years a member of the University of Oxford, and had resided in it for 8 years, and though he could not but conceive himself to be one of its humblest sons, he had the greatest affection for its ancient institutions. He thanked the meeting for the honour conferred upon him, and upon the Royal Society, and concluded by saying that the illustrious person in whose behalf he had resigned the Presidency, had distinctly commissioned him to state that his Royal Highness would have rejoiced in being present had ill-health not prevented his attendance.

The *President* next proposed "The Royal Society of Edinburgh, and its senior Vice-President, General Sir Thomas Brisbane," who briefly returned thanks.

"The Royal Society of Ireland, and Professor Hamilton," was next proposed.

Professor Hamilton, in returning thanks said, that when he looked round and saw so many eminent persons before whom he stood as a stranger, he might well be awed into silence; but he felt he should not do his duty if he did not return thanks for the honour which had been done to himself and the Academy of his country. He had spoken of Ireland as his country, and had called himself a

stranger; but he trusted and believed that in point of feeling there existed no distinction or rivalry but the rivalry of brothers, and that they would become more and more linked together by uniting their efforts in one common object—the advancement of science, and the love and zeal for truth. Although in Ireland they had an Academy which they considered to have added something to science; although they had a University, which, as dutiful children, they loved and honoured, they could not, otherwise than with reverence, approach these ancient abodes where learning dwelt and flourished even before the Norman Conquest.

The *President* then proposed "the Linnæan Society, and its Secretary, Mr. Taylor," who shortly returned thanks.

The *President* next proposed "the Geological Society of London and its President, Mr. Murchison."

Mr. Murchison returned thanks. He looked with great pride on the active part geologists had taken in the establishment of this great Association, and he should ever consider it a most auspicious moment in his career, that he happened to be one of the few individuals by whom its foundation had been *cemented*. He gloried more particularly in now seeing the chair of this Association so worthily occupied by so distinguished a geological chief. In the infancy of the Association he had been repeatedly asked, to what good results would these meetings tend? He would not expatiate on its probable advantages, but would at once state to them, that a positive and great good had already arisen from their first meeting at York. It was the happy collocation of working men of science with people of influence, which led to an act of well-merited beneficence towards that distinguished veteran in geology, William Smith, through the medium of a member of this Association, Viscount Morpeth. He would conclude by returning his warmest thanks for the honour which had been done to the Geological Society, which, depending as it did for its existence upon other branches of science, was specially bound up in the welfare of the British Association, and he was truly delighted *to see so large a number* of his geological *brethren present to express* the sense they *entertained of the* munificence and zeal for science which distinguished the University of Oxford.

The *President* then proposed "the Astronomical Society of London, and its Vice President, Professor Airy."

Professor Airy, in returning thanks, assured the Members of the Association that he had felt it to be his duty to take the utmost pains in digesting the Report on the progress of Astronomy, which had been read in the morning; and that he should never have expended so much time and labour in such a Report for any other Society than the British Association.

The *President* then proposed "the Philosophical Society of Cambridge, and its President, Professor Sedgwick."

Professor Sedgwick, in returning thanks, said, that he was called to address the meeting in consequence of having been placed during the past year at the head of the Philosophical Society of Cambridge; and if he felt any reluctance to take upon himself the present task, it was for no other reason than because there were others present who could have performed it much better than himself, and who had laboured harder for the honour of the Society than he had done. He claimed an almost paternal feeling towards the body over which he had the honour to preside, for he was one of the first of those who, seeing the importance of such an Association, not merely conversed and speculated on its practicability, but finally organised themselves into a permanent society. Newton himself thought the organization of such a society would be productive of much benefit to the University, but failed to effect his object. At that time, however, science was not so much encouraged, nor so multiplied in its forms and objects as at present; added to which, there was something so brilliant in the blaze of intellectual light which he poured forth upon the world, that minor luminaries were almost extinguished. In the University of Cambridge it was thought desirable that in such an academic body, those who felt interested in the service should combine themselves together in watching the progress of discovery; and that each taking that pursuit in the great field of science for which he was best fitted, might contribute his part towards attaining the object they had in view. These he understood were the very prin-

ciples upon which the association here assembled was also in a great part constructed. When such were the aims and objects of an institution, its success must be the wish of every good man. After all, the value of a Philosophical Society cannot be estimated by the principles of its organization, but by the importance of its works: and he appealed to the transactions of the Cambridge Philosophical Society for a proof that it had not disappointed the hopes of its founders. He here made some statements, and enumerated a series of important memoirs produced by the Cambridge Society on thermo-electricity, optics, and various branches of natural philosophy, and the applications of pure and mixed mathematics. After pointing out the advantages which had resulted from other Institutions, he concluded by proposing as a toast—"Success to the Ashmolean Society and its President, Sir Alexander Croke."

Sir Alexander Croke, in returning thanks, said, it was one of the peculiar benefits which resulted from Institutions, the objects of which were to advance the progress of knowledge, that they brought into communication the members of different societies, and united them under one common bond in the pursuit of one great and most beneficial object. When he saw around him so many eminent men in every department of science, he could not but feel it was a proud day for the University of Oxford; and he trusted that the meeting would continue united, and that the friendship which now existed between it and other societies, which had for their object the improvement of mankind, would be cemented and rendered permanent and eternal.

The President then proposed, "The Philosophical Society of Yorkshire, and the Rev. W. V. Harcourt, the late Vice-President of the Association."

The *Rev. W. V. Harcourt* said that the splendid success of this meeting must undoubtedly be highly gratifying to those with whom the plan originated; to Sir David Brewster, who suggested the idea, and was therefore entitled, if any one, to be called the founder of the association; to the individuals who seconded it, and to the society which adopted it, and undertook the task of carrying it into execution. If they had any merit in what they had done, it consisted chiefly in this—that they had fairly and truly appreciated the spirit and temper of British philosophers. The manner in which their anticipations had been fulfilled, did honour to the character of men of science. No contemptuous or jealous feeling had appeared; in England, Scotland, and Ireland, in our Universities, in our provincial and manufacturing towns, there had been a general concurrence among the cultivators of science to promote an object which might prove advantageous to the public interests; and he believed there was not a scientific individual in the three kingdoms who would not rejoice to hear of the success of this meeting. For himself, it certainly added to the deep satisfaction which he felt, that the city in which he dwelt, and the Institution with which he was connected, had been the birthplace of the Association; and equally did it add to it, that the place in which the experiment had been repeated and confirmed, was that with which were associated all the most delightful recollections of his younger days.

The President regretted that time would not permit the meeting to show that respect and attention they could wish to every provincial society, but he would propose, "The Philosophical Society of Manchester, and its President, Mr. Dalton."

Mr. Dalton returned thanks. The Philosophical Society of Manchester had existed for more than half a century, and had published 10 or 12 volumes of transactions, containing papers in different branches of science, which, in his judgment, would do credit to any society in Europe. He most cordially thanked the meeting for the honour they had done him, and should ever remember this day as one that had afforded him the highest satisfaction.

The President next proposed, "The Arts and Manufactures of Great Britain, and Professor Babbage."

Professor Babbage returned thanks. He had spent much time in examining those districts where manufactures were carried on, and he felt very strongly the connexion which existed between science and art. He was most proud in being selected to return thanks for so numerous

and useful a body; and in their names and his own he was most grateful for the honour which had been done them.

The President said the last toast which he should propose would be, "The Progress and Union of Literature and Science." In a place so peculiarly devoted to the progress of learning, it was needless to expatiate on the importance of Union. There was one individual present who was so intimately connected with literature, and with this University, that he would associate his name with the toast; and he need hardly say that individual was Lord Morpeth.

Lord Morpeth, in returning thanks, said, if he had deemed the distinction of being present at such an assembly upon such an occasion to be very high, he need not say how high he deemed it when he found the office of acknowledging this toast assigned to him by the partial kindness of the chairman. Upon the entire absence of any adequate qualifying pretension, connected, as he was, with science by no link at all—connected with the associations of this place only by the far-forgotten notes of an humble lyre, he need not dwell. The best, as indeed the only title to the honour, he could make out for himself, was the cordial sympathy he felt in the objects of this Institution, and the genuine pleasure with which he had traced it; having received its birth amid the scenes of his more habitual residence, (scenes which commended themselves to the notice of the meeting by being at once the cradle of the British Association, and the grave of the Kirkdale Hyenas), now fostered into fresh vigour and new lustre among those haunts of his youth, which had strong claims upon our veneration, attachment, and gratitude. Let them imagine if any of their enlightened and gifted guests, nay, if the merest stranger could not look upon Oxford without a glow of admiring emotion, what must be the feelings of those bosoms which cultivated the pursuits which elevated their existence within her cloistered walls, and the friendship which sweetened its venerable and peaceful shades. Let them judge then, if thus they were affected towards Oxford, what must be their gratification at seeing her *ancient* walls thrown open with kindly *hospitality to an array of* men collected *from sister universities* and sister nations, from the seats of learning, refinement, and industry—distinguished for the variety and eminence of their attainments and their inventions; devoting their time and talents to enlarge the confines of human knowledge; to augment the comforts, extend the resources, and develop the faculties of their fellow-men; to add fresh attributes to the might, the majesty, the mercy of God! These aims and ends, at once innocent, invigorating, and sublime, upon which, at this hour, and amid these deepening shadows, he would no longer pause, were included in the toast now proposed. But he could not refrain from adding a fond and fervent prayer, that whether guiding the discoveries of science, the researches of learning, or the inspiration of song, they would still continue to be identified with the progress of British fortunes, and with the prosperity and permanence of those academic institutions, which, he trusted, would in all times to come, as in all times past, be found to contribute largely to the intellect, literature, and piety of our country; and be foremost in spreading through every corner of our land the benefits of knowledge and the blessings of religion.

The party adjourned from the Hall to the rooms at the Clarendon, where sectional meetings were held; and in the Chemical Room experiments were shown by Mr. Hemming, illustrative of his communication on a safety-tube for the oxy-hydrogen blow-pipe, and for which the Society of Arts had conferred on him the large silver medal. This invention consists of a brass cylinder about four inches long and three-quarters of an inch in diameter; it is filled with equal lengths of the finest brass wire, which are wedged closely and forcibly together by a pointed rod driven into the centre of them. The interstices between the wires are in effect congeries of extremely small metallic tubes, which permit the gas to pass freely through; but by their cooling and conducting power effectually prevent the recession of a flame. The spaces between the wires are infinitely smaller than the apertures in the finest wire gauze, and the tubes possess the decided advantage of unbroken continuity; hence the decided superiority of this instrument over the old safety chamber, which is filled with layers of wire gauze.

On Wednesday morning sectional meetings were again held, and many valuable papers were read, and discussions carried on. At one o'clock the President took the chair, and business commenced. The chairman of each section read to the general meeting the report of the proceedings of the preceding day in his respective department. At the conclusion of the report of the Geological Section, the President, Dr. Buckland, requested permission of the assembly to allow Dr. Wollaston's gold medal, voted last year by the Geological Society to Mr. William Smith, to be presented to him in the presence of the members of the British Association. He accordingly called upon Professor Sedgwick, who was President of the Geological Society at the time when the medal would have been given to Mr. Smith, if it had been ready, to discharge this duty on the present occasion.

Professor Sedgwick then said, that however interesting the occasion, he should not have intruded on the notice of the meeting unless he had been called on by the chairman to perform a duty which was most gratifying to him. He rejoiced in having to declare thus publicly, an act of the society by which they recorded the opinion they entertained of the deep obligations they were under to Mr. Smith. The medal happened, by a singular accident, to be in Oxford; and Mr. Smith unexpectedly arrived on the preceding night. Since the medal had been awarded he had ceased to be President, and the sceptre had passed out of his hands; but he called on his successor to present to Mr. Smith that tribute of respect and gratitude, to which by his exertions in the cause of science he was so justly entitled.

Mr. Murchison, thus called on by his predecessor, delivered the gold medal, struck from a design by Chantry, to Mr. Smith, with these words:—"To you, William Smith, who have, by the universal voice of geologists, been pronounced the Father of English Geology, I have the sincerest pleasure, in the name, and on the behalf of the Geological Society, in presenting this medal."

Mr. Smith said he returned his most grateful thanks for the distinguished honour which had been conferred upon him, by presenting him, in an assembly of the British Association for the advancement of science, and in this distinguished University, with the medal which had been awarded to him by the Geological Society—an honour which was the more grateful to him, from the circumstance of Oxfordshire being his native county. He little thought in his youth, that so proud a moment as the present would ever arrive; but he trusted his example and success would stimulate others to follow in the same course. It was a very high gratification to him to have obtained the object of his wishes, and to have procured the good will of others. He hoped he had served his country, and in doing what he had done he had endeavoured to serve his God.

Professor Cumming read his report on thermo-electricity.

Mr. Forbes read his report on the present condition of our knowledge of Meteorology.

Mr. Willis gave a verbal account of the present state of the philosophy of sound, which he illustrated by diagrams and musical experiments.

The meeting then adjourned.

In the evening, at 9 o'clock, two very interesting lectures were given in the music room; the one by Dr. Ritchie, on Magnetic Electricity, and the other by Dr. Turner on Chemistry.

On Thursday morning, a very interesting account was delivered by Mr. Scoresby, of a singular effect produced by lightning, on the New York packet vessel. Its object was to throw light on the disputed question—whether conductors provoke the discharge of electric fluid, which might otherwise pass over a body innocuously, or carry off the fatal effects of it, though it may invite an explosion? During a terrific storm which the above vessel weathered in April 1827, an iron rod was attached as a conductor, to the mast-head, and let down in an oblique direction to the sea. A flash of lightning soon struck it, with a terrific explosion; the cabins were filled with sulphur, and the whole vessel was wrapped in flames. The lower part of the conducting rod, was found on examination to be fused, owing probably to its being thinner at that end, and therefore not having a sufficient body of conducting power. Other effects, how-

ever, were very remarkable. The compasses changed their points; all the chronometers in the vessel stopped; and what is more, parts of their mechanism were discovered to possess magnetic attraction. Every knife and fork acted like so many loadstones. An infirm and elderly gentleman who lay disabled in the ladies' cabin, was so fortunately electrified, that he instantly skipped about, and when the vessel arrived in port, walked home to his hotel. The inference which Mr. Scoresby drew from these circumstances, was, that this conducting rod, though it perhaps occasioned a severe shock from attracting the electric matter, yet saved the vessel from a fatal blast. This conclusion of Mr. Scoresby was confirmed by another gentleman, who mentioned the instance of a single vessel, armed with a similar conductor, which alone escaped injury, out of many others, not so defended, that lay close around her.

At ten o'clock, the Vice Chancellor and heads of Colleges entered the theatre in grand procession, and the Vice Chancellor opened the business of the Convocation in the usual academical form. Davies Gilbert, Esq. took his seat for the first time, as Doctor of Civil Law, a distinction which had been conferred on him by diploma. The Professor of Civil Law, Dr. Phillimore, then presented to the Convocation, four distinguished individuals, whom it was proposed to admit on this occasion to the degree of Doctors of Civil Law, Sir David Brewster, K.C.G. F.R.S. Hon. Member of the French Academy, &c.; Robert Brown, F.R.S., &c.; John Dutton Dalton, F.R.S. Member of the French Academy, &c., and Michael Faraday, F.R.S., Cor. Member of the French Academy, &c. in a very elegant and discriminating Latin speech, in which the great and distinguishing merits of these eminent philosophers were briefly stated.

All the new doctors were welcomed with loud plaudits, but none more than Mr. Dalton, owing no doubt in some degree, to the circumstance of his being a quaker. When he advanced in his doctor's gown, and especially when the Vice Chancellor pronounced the final admission, the applause was loud, universal, *and long continued.*

At half past eleven o'clock, about 150 members of the Association on horseback, accompanied by carriages containing ladies, and by many persons on foot, assembled near Magdalen Bridge, to attend a lecture by Professor Buckland, on the geology of the town of Oxford. In the course of his lecture, the professor explained to his audience, the importance of geology, as connected with agriculture. He demonstrated by examples the dependence of the character of the soil upon the condition of the subjacent strata; and called attention to the adaptation of sand, and calcareous and argillaceous soils to the different modes of agriculture. He enlarged on the advantages of improving the mineral condition of all soils by artificial manures, the application of which is founded on the principles of agricultural chemistry; and suggested the importance of adding to the Geological Committee of the Association, a section to be devoted to the improvement of agriculture. He expatiated on the agricultural state of Ireland, as connected with the possibility of reclaiming peat-bogs, distinguishing those which are capable of being reclaimed, from those which, in his opinion, can never be reclaimed without an outlay of capital far exceeding any profitable return. He also explained the manner in which water is supplied from the sea, through the medium of the atmosphere, to fertilize the earth by rains, and to furnish a perpetual supply of water for the maintenance of springs and rivers. The Professor pointed out many defects in the ordinary systems of draining, and illustrated by examples the important fact that large tracts of land might be permanently drained at small expense, by methods depending entirely on a consideration of the geological structure of the substrata. He also spoke of Artesaan wells, and suggested the advantage that would arise from a more general application of them in the neighbourhood of London. After an excursion of nearly six hours, occupied chiefly in exhibiting the geological character of the neighbourhood, the professor returned with the party to dinner.

In the evening the different sections were occupied with papers and discussions as in the preceding evening.

(The conclusion of the proceedings in our next.)

"ECONOMY OF MACHINERY AND MANUFACTURES.*"

A work of peculiar interest to the mechanical world has just appeared, under the above title, from the pen of Mr. Babbage. The object of it is to point out and classify the various advantages which arise from the employment of tools and machines, in aid of human industry. It is stated, by its distinguished author, to have had its origin in the calculating-engine, the construction of which he has so long been superintending:—

"Having been induced, during the last ten years, to visit a considerable number of workshops and factories both in England and on the Continent, for the purpose of endeavouring to make myself acquainted with the various resources of mechanical art, I was insensibly led to apply to them those principles of generalization to which my other pursuits had naturally given rise. The increased number of curious processes and interesting facts which thus came under my attention, as well as of the reflections which they suggested, induced me to believe that the publication of some of them might be of use to persons who propose to bestow their attention on those inquiries which I have only incidentally considered."—*Preface.*

Mr. Babbage commences with some remarks on the "general sources of the advantages arising from machinery and manufactures." These he considers to be, 1. "The addition which they make to human power," as in machinery actuated by wind, water, or steam; 2. "the economy they produce of human time;" and, 3. "the conversion of substances apparently common and worthless into valuable products." We cannot commend this classification, as either correct or clear. Effects are confounded with causes, and causes with effects. The "sources of the advantages" are but the advantages themselves; the "machinery;" which is the producing agent, and the "manufactures," which are the product, are considered as of one and the same nature; and, again, the addition which machinery and manufactures make to human power is treated as one thing, and the economy of time which they produce as another, though the latter is manifestly involved in the former. Neither is Mr. Babbage's tripartite division by any means comprehensive enough. Under which of the three divisions ought we to look for the superior accuracy of execution attained by machinery? Or for that celerity of production, which, though like to saving of time, is yet something very different? The instances by which Mr. B. illustrates his three principal advantages are all apposite enough, though, it must be confessed, somewhat common. We select two of the most interesting:—

Economy of Time.—"The art of using a diamond for cutting glass has undergone within a few years, a very important improvement. A glazier's apprentice, when using a diamond set in a conical ferrule, as was always the practice about twenty years since, found great difficulty in acquiring the art of using it with certainty; and at the end of seven years' apprenticeship many were found but indifferently skilled in its employment. This arose from the difficulty of finding the precise angle at which the diamond cuts, and of guiding it along the glass at the proper inclination when that angle is found. Almost the whole of the time consumed and of the glass destroyed in acquiring the art of cutting glass, may now be saved by the use of an improved tool. The gem is set in a small piece of squared glass, with its edge nearly parallel to one side of the square. A person skilled in its use now files away one side of the brass, until by trial he finds the diamond will make a clean cut, when guided by keeping this edge pressed against a ruler. The diamond and its mounting are now attached to a stick similar to a pencil, by means of a swivel, allowing a small angular motion. Thus the merest tyro at once applies the cutting edge at the proper angle, by pressing the side of the brass against a ruler; and though the part he holds in his hand should deviate a little from the required angle, it communicates no irregularity to the position of the diamond, which rarely fails to do its office when thus employed."—P. 9.

Employment of materials of little value.—"The skins used by the gold-beater are produced from the offal of animals. The hoofs of horses and cattle, and other horny refuse, are employed in the production of the prussiate of potash, that beautiful, yellow, crystallized salt which is exhibited in the shops of some of our chemists. The worn-out saucepans and tin-ware of our kitchens, when beyond the reach of the tinker's art, are not utterly worthless. We sometimes meet carts loaded with old tin kettles and worn-out iron coal-scuttles traversing our streets.

* *By Charles Babbage, Esq., A. M., Lucasian Professor of Mathematics in the University of Cambridge, &c. 320 pp. 12mo, Charles Knight.*

These have not yet completed their useful course; the less corroded parts are cut into strips, punched with small holes, and varnished with a coarse black varnish for the use of the trunk-maker, who protects the edges and angles of his boxes with them; the remainder are conveyed to the manufacturing chemists in the outskirts of the town, who employ them in conjunction with pyroligneous acid in making black dye for the use of calico-printers."—P. 10.

The mechanical agents by which the "addition to human power is obtained," are afterwards divided into two classes—1st. "those which are employed to produce power;" and, 2nd, "those which are intended merely to transmit force and execute work." But it is observed of the first, that "although they are to us immense acquisitions, yet in regard to two of them—the force of wind and of water, we merely make use of these bodies in a state of motion by nature—we change the directions of their movement in order to render them subservient to our purposes, but we neither add to nor diminish the quantity of motion in existence." To corroborate this, Mr. Babbage adds the following illustration:—

"If we avail ourselves of a descending stream to turn a water-wheel, we are appropriating a power which Nature may appear at first sight to be uselessly and irrecoverably wasting, but which, upon due examination, we shall find she is ever repairing by other processes. The fluid which is falling from a higher to a lower level carries it with the velocity due to its revolution with the earth at a greater distance from its centre. *It will, therefore, accelerate, though to an almost infinitesimal extent, the earth's daily rotation.* The sum of all these increments of velocity arising from the descent of all the falling waters on the earth's surface, would in time become perceptible, did not Nature, by the process of evaporation, convey the waters back to their sources; and thus, again, by removing matter to a greater distance from the centre, destroy the velocity generated by its previous approach."—P. 17.

All this is doubtless very profound, but, to our thinking, it is very nearly akin to trifling. Were mathematics to throw no more light on practice than is here done, their value would be, like Mr. Babbage's deduction, *infinitesimal*. But it is not correct to say of the force of *water, that "we merely make use of it in a state of motion by nature."* Water *is not in a state of motion* when employed in a hydraulic-press; nor in a canal; nor in a well; nor under fifty other circumstances in which it is employed as a mechanical agent.

The subject of accumulating power, as in the fly-wheel—of regulating power, as by the steam-governor—of increasing and diminishing velocity, as by the spinning-wheel and smoke-jack—and of extending the time of action of forces, as in clocks and watches—are each treated of in separate and brief chapters.

A chapter then follows on the "saving of time in natural operations," which is illustrated by the cases of tanning, bleaching, salt-making, and river-dredging, of which last we are presented with the following remarkable instance:—

"Amongst natural operations perpetually altering the surface of our globe, there are some which it would be advantageous to accelerate. The wearing down of the rocks which impede the rapids of navigable rivers, is one of this class. A very beautiful process for accomplishing this object has been employed in America. A boat is placed at the bottom of the rapid, and kept in its position by a long rope which is firmly fixed on the bank of the river near the top. An axis, having a wheel similar to a paddle-wheel of a steam-boat fixed at each end of it, is placed across the boat, so that the two wheels and their connecting axis shall revolve rapidly, being driven by the force of the passing current. Let us now imagine several beams of wood, shod with pointed iron, fixed at the ends of strong levers, projecting beyond the bow of the boat.

"If these levers are at liberty to move up and down, and if one or more projecting pieces called cams are fixed on the axis opposite to the end of each lever, the action of the stream upon the wheels will keep up a perpetual succession of blows. The sharp-pointed shoe striking upon the rock at the bottom will continually detach small pieces, which the stream will immediately carry off. Thus, by the mere action of the river itself, a constant and most effectual system of pounding the rock at its bottom is established. A single workman may, with the aid of a rudder, direct the boat to any required part of the stream; and when it is necessary to move up the rapid, as the channel is cut, he can easily cause the boat to advance by a capstan.

"When the object of the machinery just described has been accomplished and the channel is sufficiently deep, a slight

alteration converts the apparatus to another purpose almost equally advantageous. The stampers and the projecting pieces on the axis are removed, and a barrel of wood or metal surrounding part of the axis, and capable, at pleasure, of being connected with or disconnected from the axis itself is substituted. The rope which hitherto fastened the boat is now fixed to this barrel, and if the barrel is loose upon the axis, the paddle-wheels make the axis only revolve, and the boat remains in its place; but the moment the axis is attached to the surrounding barrel, this begins to turn and winding the rope upon itself, the boat is gradually drawn up the stream, and may be employed as a kind of a tug-boat for all the vessels that have occasion to ascend the rapid. When the tug-boat reaches the summit the barrel is released from the axis, and friction being applied to moderate its velocity, the boat is allowed to descend."—P. 33, 34.

On the subject of "registering operations" there is a very good chapter, and among the examples cited there is one, which, for its ingenuity and novelty, is well worth quoting:—

"The time and labour consumed in gauging casks partly filled has led to an improvement, which by the simplest means obviates a considerable inconvenience, and enables any person to read off on a scale the number of gallons contained in any vessel as readily as he does the degree of heat indicated by a thermometer. A small stop-cock is inserted near the bottom of the cask, which it connects with a glass tube of narrow bore fixed to a scale on the side of the cask, and rising a little above its top. The plug of the cock may be turned into three positions: in the first it cuts off all communication with the cask: in the second it opens a communication between the cask and the glass tube; and in the third it cuts off the communication between the cask and the tube, and opens a communication between the tube and any vessel held beneath the cock to receive its contents. The scale of the tube is graduated by opening the communication between the cask and the tube, and pouring into the cask a gallon of water. A line is then drawn on the scale opposite the place to which the water rises. This operation is repeated, and at each successive gallon a new line is drawn. Thus the scale is formed by actual measurement*; both the proprietor and the excise officer on inspection find the contents of each cask, and the tedious operation of gauging is altogether dispensed with. Other advantages accrue from this simple contrivance in the great economy of time which it introduces in making mixtures of different spirits, in taking stock, and on having spirits from the distiller."—P. 41.

The next topic discussed is "the economy of the materials employed." Here Mr. B. draws his principal illustration from the art of printing, and as it possesses, in consequence of its connexion with literature, more than ordinary interest, we shall extract the passage at length:—

"The rapid improvements which have taken place in printing presses during the last twenty years afford another instance of saving in the material consumed, which is valuable because admitted and well ascertained by measurement. In the old method of inking type by large hemispherical balls stuffed and covered with leather, the printer, after taking a small portion of ink from the ink-block, was continually rolling them in various directions against each other, in order that a thin layer of ink might be uniformly spread over their surface; this he again transferred to the type by a kind of rolling motion. In such a process, even admitting considerable skill in the operative, it could not fail to happen that a larger quantity of ink should get near the edges of the balls, which not being transferred to the type, became hard and useless, and was taken off in the form of a thick black crust. Another inconvenience also arose; the quantity of ink spread on the block not being regulated by measure, and the number and directions of the transits of the inking balls over each other depending on the will of the operator, and being irregular, it was impossible to place on the type a uniform layer of ink of exactly the quantity sufficient for the impression. The introduction of cylindrical rollers of an elastic substance, formed by the mixture of glue and treacle, superseded the inking balls, and produced considerable saving in the consumption of ink; but the most perfect economy was only to be produced by mechanism. When printing-presses, moved by the power of steam, were introduced, the action of those rollers was found well adapted to the performances of the machine: a reservoir of ink was formed, from which one roller regularly abstracted a small quantity at each impression. From three to five other rollers spread this portion uniformly over a slab (by most ingenious contrivances varied in almost

* *This contrivance is due to Mr. Hennekey, of High Holborn, in whose establishment it is in constant employment.*

every kind of press), and another travelling roller, having fed itself on the slab, passed and re-passed over the type just before it gave the impression to the paper.

"The following is an account of the result of an accurate experiment upon the effect of the process just described, made at one of the largest printing establishments in the metropolis*. Two hundred reams of paper were printed off, the old method of inking-balls being employed; two hundred reams of the same paper and for the same book were then printed off in the presses that inked their own type. *The consumption of ink by the machine was to that by the balls as four to nine, or rather less than one half.* In order to show that this plan of inking puts the proper quantity of ink on the type, we must prove first, that it is not too little; this would soon be discovered by the complaints of the public and the bookseller: and, secondly, that it is not too much: this latter point is satisfactorily established by a reference to the frequency of the change of what is called the *set-off sheet*, in the old method. A few hours after one side of the paper has been printed upon, the ink is sufficiently dry to allow it to receive the impression on the other, and a considerable pressure is made use of; the tympan on which the side first printed is laid is guarded from soiling it by a sheet of paper called the *set-off sheet*. This paper receives in succession every sheet of the work to be printed, and acquires from them more or less of the ink, according to their dryness, or the quantity upon them. It was necessary in the former process, after about one hundred impressions, to change the *set-off sheet*, which, in that time, became too soiled for further use. In the new method of printing by machinery, no *set-off sheet* is used, but a blanket is employed as its substitute; and this does not require changing above once in five thousand impressions, and instances have occurred of its being sufficiently clean for twenty thousand. Here then is a proof that the quantity of superfluous ink put upon the paper in machine printing is so small, that if multiplied by five thousand, and in some instances by even twenty thousand, it is only sufficient to render useless a single piece of cloth†."—p. 45-47.

A chapter follows "on copying," that is, on the various modes of printing, engraving, casting, &c., which is perhaps the very best in the book. The classification given of the arts, of which copying is the basis, is very complete and instructive. Mr. B. mentions a mode of representing delicate vegetable productions, invented by Mr. Chantrey, of which we had not heard before:—

"A very beautiful mode of representing small branches of the most delicate vegetable productions in bronze has been employed by Mr. Chantrey. A small strip of a fir-tree, a branch of holly, a curled leaf of brocoli, or any other vegetable production, is suspended by one end in a small cylinder of paper, which is placed for support in a similarly formed tin case. The finest river salt, carefully separated from all coarser particles, and mixed with water so as to have the consistency of cream, is poured into the paper cylinder by small portions at a time, carefully shaking the plant after each addition, in order that its leaves may be covered, and that no particles of air may be left. The plant and its mould are now allowed to dry, and the yielding nature of the paper allows the loamy coating to shrink from the outside. When this is dry it is surrounded by a coarser substance, and finally we have the twig and all its leaves imbedded in a perfect mould. This mould is carefully dried and then gradually heated to a red heat. At the end of some of the leaves or shoots wires have been left to afford air-holes by their removal; and in this state of strong ignition a stream of air is directed into the hole formed by the end of the branch: the consequence of which is, that the wood and leaves which had been turned into charcoal by the fire are now converted into carbonic acid by the current of air: and after some time the whole of the solid matter of which the plant consisted is completely removed, leaving a hollow mould, bearing on its interior all the minutest traces of its late vegetable occupation. When this process is completed, the mould being still kept nearly at a red heat, nearer the fluid metal, which by its weight either drives the very small quantity of air which at that high temperature remains behind, out through the air-hole, or compresses it into the pores of the very porous substance of which the mould is formed."—p. 62.

There is also a singular account given of a mode of printing from copper-plates with altered dimensions, the secret process of which remains still undiscovered:—

"*Printing from Copper-plates, with altered dimensions.*—Some very singular specimens of an art of copying, not yet made public, were brought from Paris a few

* This experiment was made at the establishment of Mr. Clowes, in Stamford-street.

† *In the very best kind of printing* it is necessary *in the old method to change* the set off sheet once in *twelve times. In printing* the same kind of work by *machinery the blanket is only* changed once in 2,000.

years since. A watchmaker in that city, of the name of Gonord, had contrived a method by which he could take from the same copper-plate, impressions of different sizes, either larger or smaller than the original plan. Having procured four impressions of a parrot, surrounded by a circle, executed in this manner, I showed them to the late Mr. Lowry, an artist equally distinguished by his skill, and for the many mechanical contrivances with which he enriched his art. The relative dimensions of the several impressions were 5·5, 6·3, 8·4, 15·0, so that the largest was nearly three times the linear size of the smallest; and Mr. Lowry assured me that he was unable to detect any lines in one which had not corresponding lines in the other. There appeared to be a difference in the quantity of ink, but none in the traces of the engraving, and from the general appearance it was conjectured that the largest but one was the original impression of the copper-plate. The processes by which this singular operation was executed have not been published; but two conjectures were formed at the time which merit notice. It was supposed that the artist was in possession of some method of transferring the ink from the lines of a copper-plate to the surface of some fluid, and of re-transferring the impression from the fluid to the paper. If this could be accomplished, the print would be of exactly the same size as the copper-plate from which it was derived; but if the fluid were contained in a vessel of the form of an inverted cone, with a small aperture at the bottom, the liquid might be lowered or raised in the vessel, by gradual abstraction or addition, through the apex of the cone: in this case, the surface to which the printing-ink adhered would diminish or enlarge. And in this altered state the impression might be re-transferred to paper. It must be admitted that this conjectural explanation is liable to very considerable difficulties; for although the converse operation of taking an impression from a liquid surface has a parallel in the art of marbling paper, the possibility of transferring the ink from the copper to the fluid"—P. 83-85.

Thus far Mr. Babbage may be said to have treated merely of the mechanical part of his subject; in the rest of the volume he directs his attention to those politico-economical considerations which relate more immediately to arts and manufactures; such as, the circumstances which influence prices, as supply and demand, genuineness, fashion, *opinion, durability*, &c.—division of *labour—size and situation* of factories —over manufacturing—combinations of master and men—the truck system—effect of taxes and legal restrictions—exportation of machinery, &c. Did our space permit, we might extract largely, and to advantage, from this section of the work, but we must be content with selecting from those passages we had marked for quotation two or three of the more original.

Effect of Opinion on Price.

"The history of *Cajeput oil* during the last few months, affords a curious illustration of the effect of opinion in price. In July of the last year (1831) Cajeput oil was sold, exclusive of duty, at 7d. per ounce. The disease which had ravaged the east was then supposed to be approaching our shores, and its proximity created alarm. At this period the oil in question began to be much talked of as a powerful remedy in that dreadful disorder; and in September it rose to the price of 3s. and 4s. the ounce. In October there were few or no sales; but in the early part of November, the speculations in this substance reached their height; and between the 1st and 15th it realized the following prices: 3s. 9d., 5s., 6s. 6d., 7s. 6d., 8s., 9s., 10s., 10s. 6d., 11s. After the 15th of November the holders of Cajeput oil were anxious to sell at much lower rates; and in December a fresh arrival was offered by public sale at 5s. and withdrawn, being sold afterward, as it was understood, by private contract, at 4s. or 4s. 6d. per ounce. Since that time 1s. 6d. and 1s. have been realized: and a fresh arrival, which is daily expected (March, 1832) will probably reduce it below the price of July. Now, it is important to notice, that in November, the time of greatest speculation, the quantity in the market was held by *few* persons, and that it frequently changed hands, each holder being desirous to realize his profit. The quantity imported since that time has also been considerable.*"—p. 110.

Character.

"The influence of established character in producing confidence, operated in a very remarkable manner at the time of the exclusion of the British manufactures from the continent during the last war. One of our largest establishments had been in the habit of doing extensive business with a house in the centre of Germany; but, on the closing of the continental ports against our manufactures, heavy

* I have understood that the price of camphor, at the same time, suffered similar changes.

penalties were inflicted on all those who contravened the Berlin and Milan decrees. The English manufacturer continued, nevertheless, to receive orders, with directions how to consign them, and appointments for the time and mode of payment, in letters, the hand-writing of which was known to him, but which were never signed, except by the christian name of one of the firm, and even in some instances they were without any signature at all. These orders were executed; and in no instance was there the least irregularity in the payments."

Project for a quicker conveyance of Letters.

"Let us imagine a series of high pillars erected at frequent intervals, perhaps every hundred feet, as nearly as possible in a straight line between the two post towns. An iron or steel wire of some thickness must be stretched over proper supports fixed on each of these pillars, and terminating at the end of every three or five miles, as may be found expedient, in a very strong support, by which it may be stretched. At each of these latter points a man ought to reside in a small station-house. A narrow cylindrical tin case, to contain the letters, might be suspended by two wheels rolling upon this wire: these might be so constructed as to enable them to pass unimpeded by the fixed supports of the wire. An endless wire of much smaller size must pass over two drums, one at each end. This wire should be supported on rollers fixed to the supports of the great wire, and a little below it. With this arrangement there would be two branches of the smaller wire always accompanying the larger one; and the attendant at either station might, by turning the drum, cause these two branches of the small wire to move with great velocity in opposite directions. In order to convey the cylinder which contains the letters, it would be necessary to attach it by a string, or by a catch, to either of the branches of the smaller wire. Thus it would be conveyed speedily to the next station, where it would be removed by the next attendant to the commencement of the next wire, and thus transmitted on. It is unnecessary to enter into the details which this, or any similar plan, would require. These difficulties are obvious; but if these were overcome, it would present many advantages beside velocity; for if an attendant reside at each station, the additional expence of *having two or three* deliveries of letters *every day, and even of* sending expresses *at any moment,* would be comparatively trifling: and it is not impossible that the stretched wire might itself be available for a species of telegraphic communication still more rapid."

"Perhaps if the steeples of churches, properly selected, were made use of in connecting them with a few intermediate stations with some great central building, as, for instance, with the top of St. Paul's, and if a similar apparatus were placed on the top of each steeple, and a man to work it during the day, it might be possible to diminish the expense of the twopenny-post, and make deliveries every half hour over the greater part of the metropolis." pp. 219--21.

The Effect of Duties upon the Import of Foreign Manufactures.

"The effect of duties upon the import of foreign manufactures is equally curious. A singular instance occurred in the article *bar iron*, which was liable to a duty of 140 per cent. *ad valorem* on introduction into the United States, whilst that upon hardware was 25 per cent. In consequence of this tax, large quantities of malleable iron-rails for rail-roads were imported into America under the denomination of hardware, and the difference of 115 per cent. in duty more than counterbalanced the expense of fashioning the iron into rails prior to its importation.

"Duties, drawbacks, and bounties, when considerable in amount, are all liable to objections of a very serious nature, from the frauds to which they give rise. It has been stated before Committees of the House of Commons, that calicoes made up in the form, and with the appearance, of linen, have frequently been exported for the purpose of obtaining the bounty. The calico made up in this way sells at 1*s.* 4*d.* per yard; whereas linen of equal fineness is worth from 2*s.* 8*d.* to 2*s.* 10*d.* per yard. It appeared from such evidence, that one house in six months sold 500 such pieces."—P. 273--4.

Mr. Babbage winds up with a chapter on "the future prospects of manufactures as connected with science," on which he appears to have put forth all his strength. It is very ably, indeed eloquently, written; and, with the exception of so much of it as consists of a repetition of his old lamentations about the exclusion of men of science from blue ribbons and white wands, is generally very just. He animadverts with merited severity on the conduct of the Duke of Sussex, in accepting of the Presidency of the Royal Society, or, to speak more properly, in snatching at it —for he was but elected by a majority

of *eight*—and two-thirds of the members refrained, out of courtesy, from voting; and affirms, what we believe to be quite true, that the usefulness of the Society has been already much impaired, through his Royal Highness's most ill-advised intrusion upon it. The decline of the Royal Society naturally leads the author to advert to the "British Association for the Promotion of Science," of whose second annual meeting we have given so full an account in the preceding pages of this number; and of which Mr. B. is at once an active member and most fervent admirer. He observes, that in the present state of that body (the Royal Society) such an Association is almost necessary for the purposes of science." We admit that it is a very expedient Association; but we do not see how it can be called a "necessary" one; and, least of all, that it can be necessary for the reason Mr. B. assigns. Mr. B. ascribes to societies, as he does to titles and distinctions, a great deal too much influence. We apprehend that the march of science would have gone on—not so quickly, perhaps, but still very surely—though neither Royal Society nor British Association had ever existed. However much such institutions may accelerate the acquisition of knowledge, they are at best but helps only; like staff or hostelry to the far-bound pilgrim, yet neither hand nor foot. Science, as Mr. B. truly observes, sometimes makes a "giant's stride;" and it would not, we apprehend, take more than that, to stride over a dozen such mis-patronised and mis-managed institutions as the Royal Society. Indeed, Mr. B. himself loses sight altogether of these "necessary" adjuncts, as he goes on to speculate about the future progress of science in establishing the dominion of mind over matter. His only doubt, at last, on the subject is that "the weak arm of man may want (not Societies, *but*) the physical force requisite to render his knowledge available." For the sanguineness of his anticipations on this head, he apologises in a passage of great force and beauty.

"Perhaps to the sober eye of inductive philosophy, these anticipations of the future may appear too faintly connected with the history of the past. When time shall have revealed the future progress of our race, those laws which are now *obscurely indicated* will then become *distinctly apparent*, and it may possibly be found that the dominion of mind over the material world advances with an ever accelerating force. Even now, the imprisoned winds which the earliest poets made the Grecian warrior bear for the protection of his fragile bark, or those which in more modern times the Lapland wizards sold to the deluded sailors; these, the unreal creations of fancy or of fraud, called at the command of science from their shadowy existence, obey a holier spell; and the unruly masters of the poet and the seer become the obedient slaves of civilized man. Nor has the wild imagination of the satirist been quite unrivalled by the realities of after years; as if in mockery of the college of Laputa, light almost solar has been extracted from the refuse of fish, fire has been sifted by the lamp of Davy, and machinery has been taught arithmetic, instead of poetry*"—P. 318.

Mr. B. has produced upon the whole, a very clever, entertaining, and instructive book; one which deserves to be generally read, and will doubtless be so. Its chief defects are a parade of arrangement and generalization, whereas, in reality, there is very little of either. Mr. B.'s classifications and definitions are almost always singularly vague and confused; and this in a professor of the exact sciences, must be allowed to be a prime fault. We are afraid—nay, we are quite sure—that the book, though well calculated to satisfy the young, the uninformed, and the superficial, will not raise the class of mathematicians in the estimation of intelligent practical men. Mr. B. has been a great deal more successful in shewing how much a man of the first eminence at Cambridge may have to learn of the real business of life, than in demonstrating the benefits which the theory there studied can confer on practice. To set forth these benefits clearly and distinctly, is still a task to be performed; and to perform it worthily might be an object of ambition even to our Lucasian professor. He has all the qualifications for it—an observant, acute, vigorous, and comprehensive mind, and habits of great industry and perseverance; he wants only a little more experience—a little more mixing with the world; and for this, there is yet time enough

* In future editions, Mr. Babbage would make his meaning clearer by saying, "And machinery, though not taught poetry, has at least been taught arithmetic."

—for Mr. Babbage—to his great honour be it spoken—is young in years, though old to fame.

ILLUMINATED DIALS.

Sir,—I am glad to find that the method already in use of illuminating church-clocks is not so expensive as it was generally reported to be: at the same time, I must observe, in my own vindication, that there was some foundation for the assertion that the cost was "*understood to be* not far short of one hundred pounds." Mr. Paine (page 190), to prove this statement exaggerated, tells us what he received for lighting the Whitechapel clocks, but he does not say what his bill for St. Giles's or Islington amounted to: if to less than double that for Whitechapel, he has been most grievously injured by that "common liar," common report. At any rate, he ought to feel obliged for the opportunity of disabusing the public mind on the subject, through the medium of your widely-read pages. Now that it is publicly and generally known that his charges are so much more moderate than they were understood to be, I have no doubt his invention will make a much more rapid progress than it has done hitherto.

Yet, after all, even *fifty* pounds is a good round sum to lay out for such a purpose; and I cannot help thinking, notwithstanding Mr. Paine's objurgations, that the simple mode I suggested would be much less expensive than that gentleman's. He attempts to frighten the new-light philosophy out of the field, by a truly terrific estimate as to the cost of the plate of glass that, he imagines, would be required by the new system for the clock-face,—no less than 6*l.* 15*s.* at one blow! Fortunately, however, my mode does not make it necessary that the inner circle should be composed of one piece of glass, or even that the material should be glass at all. A piece of tin or sheet-iron, having the shape of a hand punched out of it, would answer as well as any thing, and would, I believe, not cost even so much as the odd fifteen shillings, leaving the six pounds to go towards the tremendous expenses of "attaching it to the works, painting and gilding, scaffolding, removing the old dial,"* and the long list of et-cetera with which Mr. Paine would "fright us from our propriety." This being the only objection Mr. Paine has advanced against my suggestion, its futility encourages me in the belief that no strong ones can be produced: if the contrary should be the case, the sooner Mr. P. can find "time" to state them, the better.

Meanwhile, I remain,
Sir, yours, &c.
F. H.

26th June, 1832.

* *As to "removing the old dial," if it had to be removed, it ought at any rate to pay for the fetching away.*

INDIAN ARTS AND MANUFACTURES, No. V.

Paper.

Sir,—I had lately an opportunity of seeing the process of manufacturing paper as performed at Jooneer in the Deccan. The master of this manufactory owns thirty karkhanas, or workshops, in the town, and twenty-five shops established for the sale of the article in other large towns of the Deccan; he has in his employ above a thousand workmen, every part of the manufactory being conducted by manual labour.

The substance of which the paper is composed is hemp; the coarsest camel bags, ropes, cables, all come into use. The first process is to wet the hempen substance and beat it well, by means of a heavy wooden beam, worked by four men, who simultaneously stamp on one end; the other end being raised, is allowed to fall by its own weight on the hemp below, which is in a small well, in which a man sits and pushes the hemp under the beam between every stroke of it, both the beam and the bottom of the well being shod with iron. After this has been done some time, it is taken down to the river, and being mixed with lime, is well washed in a cloth by two men; it is then laid in the sun to bleach and dry, after which it is again subjected to the stamping process; this is repeated five or six times, according to the whiteness and fineness of the paper required, except that after the first time the hemp is washed with soap instead of lime.

When beaten and bleached enough, it is put with a quantity of water into small tanks or reservoirs, six feet long, three broad, and one or two deep. The paper manufacturer then takes a wooden frame about two feet square, and on this lays a fine kind of mat or sieve made of extremely thin reeds, and having gently

stirred up the water to mix the hempen substance with it, he puts the frame into the water, and, gently raising it, the water passes through the reeds, and leaves on them a thin coat of the hempen substance. This is then turned off the sieve on to another similar to it. This he continues to do until there are several on the sieve, when they are taken away, and after being dried a little, they are taken up one by one, and by the assistance of a brush drawn over them are stuck against the wall. When still drier they are taken from the wall (several sheets being stuck together), and are hung up to dry entirely, being perhaps eight or ten sheets in thickness, and three or four in length. When perfectly dry they are easily separated, and made into quires. Each quire is then laid on a flat board, and a rule being pressed on it, the edges are cut off by means of a large two-edged knife.

The next process is that of glazing or sizing the paper, but that being done by the *ladies* of the family, I was not permitted to view it; it is done, I understand, by means of wheaten paste.

Yours, obediently,

BENGEIR.

Deccan, Feb. 10th, 1832.

MILESTONE COTTAGES.

Sir,—I should not have troubled you with any reply to the last letter of T. had he not called upon me to avow that I had done him an injustice in my former communication. It seems he did not mean to propose that every military pensioner should be mulcted of five pounds to go towards the expenses of the Milestone-cottage scheme, but simply that the produce of colonial lands sold to military pensioners should be applied in furtherance of that promising project. It is no wonder that his meaning should have been but dimly distinguished through "the mist of his eccentricity:" indeed, I have often been tempted to believe that friend T. was hoaxing, and meant to mean nothing at all. As to his plan of raising the Milestone-cottage Building-fund, it removes no difficulty whatever; the sum required might just as well be taken out of the taxes at once. T. seems to think I *intend to "enter the field" against him. I beg to decline* the invitation until he has answered the unanswerable arguments advanced in my last.

Yours,

KALOPINO.

26th June, 1832.

ON THE HEIGHT OF THE ATMOSPHERE—BY CAPTAIN FORMAN, R.N.*

The height of the atmosphere is a question which has attracted the notice of many of our most eminent astronomers; but their opinions upon this subject, at least as far as I am acquainted with them, are at once vague and unsatisfactory. It has been inferred by some that the appearance of twilight justifies the opinion that the atmosphere, or, at least, that part of it which reflects light, reaches to the height of 45 or 50 miles; but, as I shall show in another paper, they have no good reason to suppose that the atmosphere does reflect light; and, moreover, if they had, unless they can state the amount of light that is reflected from every particle of atmospheric air, it is difficult to conceive why ten, or even five, miles of a reflecting substance would not produce the same effect which they attribute to 40 or 50 miles.

Others, again, seem to assign no limits whatever to the earth's atmosphere; for they seriously tell us that, if that quantity of atmospheric air, which, at the earth's surface, is compressed within the space of a cubic foot, were lifted up to the upper surface of the atmosphere, where it would be subject to no compression, it would expand to such a degree, as to fill up as large a quantity of space as is comprised within the whole orbit of Saturn. Hence, if they mean to be consistent, they are bound to admit, as their opinion, that the earth's atmosphere reaches, very nearly, as far as the regions of the fixed stars; and that the different planets are absolutely sailing about in each other's atmospheres, without producing any jostling, or confusion, in these opposing fluids!

If it should be argued that, though this opinion has been (to all appearances) seriously inserted in many treatises on astronomy, and in most of our encyclopædias, it is merely a loose expression that was never meant to be understood in

* From "Treatises on several very important subjects on Natural Philosophy," by Captain Forman, just published.

a literal sense, I ask in what way are we to distinguish between what our philosophers would have us entertain as sound doctrine, and what is only intended to amuse us, when they take it into their heads to be witty?

Be this, however, as it may, it is sufficiently evident that, to this day, our astronomers have not thought of any well-grounded principle by which this interesting problem may be satisfactorily resolved; and as it is equally evident, by many having made the attempt, that the solution of it is considered to be a desideratum, I shall venture (at the risk of exposing myself to a sneer) to submit to their consideration a method, by which, with the help of three barometers, the truth, though, perhaps, it cannot be precisely ascertained, may probably be approximated.

It is admitted, by all, that the atmosphere is a compressible body, and that the only cause of the differences in the density of its different parts is the greater or less quantity of air (that is, the greater or less weight) that rests upon them. Taking then these admissions for my premises, I shall proceed to show in what way the height of the atmosphere, at the time of observation in any place, may be found within the fraction of a mile, by the simple rule of proportion. Thus for instance, if, at the height of 400 yards, the mercury in the barometer should sink two inches, and at 800 yards one inch more, or three inches altogether, it would, necessarily, by the same rule of proportion, sink one inch and a half more, or four inches and a half altogether, at the height of 1,600 yards; and, by continuing this same rule of proportion till there were no mercury left in the tube, we should have the height (very nearly) of the atmosphere at the time of observation.

All that will be necessary, will be to select a convenient spot, as nearly as possible on the level of the surface of the ocean, that is in the immediate neighbourhood of a steep ascent*; mark three stations, the middle one of which is to be precisely as much above the lowest, in perpendicular height, as it is below the highest; and then let three observers note the height of the mercury, in the barometrical tube, at these three stations, in the same moment of time, which of course can be done by signal. By doing this, we shall have the proportion which the barometer falls, on being raised, from one station to another which is twice as high; and this proportion being found, we have only to continue doubling the heights, until we come to that point where there is no more mercury left in the tube; for, in the same proportion that the mercury at the height of—say, 220 yards, sinks less than it does at the height of 400 yards, it will sink less at the height of 440 yards than it does at the height of 880; and, by repeating this rule of proportion, we shall come at last to that height in which there is no more atmosphere to lift up the mercury.

As it is well known that heat expands atmospheric air, and cold condenses it, it necessarily follows that the atmosphere must be highest over the equatorial regions, and lowest in the neighbourhood of the poles; and probably in the latitudes of 45° or 50°, the height of the atmosphere is generally about the mean between the two extremes.

Again, by having a thermometer at the lowest station, and making the observations, first when both the barometer and thermometer stand very high, and afterwards when they are very low, we shall have very nearly the greatest and least heights of the atmosphere at that place; I say very nearly, because it cannot be denied that there may occasionally be currents of hot or cold winds, passing through the higher regions, which, as they cannot be corrected for, would, in some degree, produce an error in calculation; but it is at least possible, if not very probable, that the errors, which were produced, on one side by hot or cold currents of air, would be corrected by other currents of an opposite character; and, at all events, it is not very likely that these hot and cold currents of air, even if they should all act in one way, could produce an error in the calculation of more than one mile in twenty.

* *Ladder Hill, in the Island of St. Helena, would form an excellent station for this purpose, and so also would Gibraltar.*

ON STREET PAVING.

Sir,—Too much consideration I think cannot be given to the subject of street-paving; and the chief objects to attain are, solidity and safety. I would therefore propose to make a firm bottom of

ground granite, elevated in the middle, six inches in every 30 feet, the fall of course being to the sides. Upon this I would place stones about nine or ten inches deep—five inches square at top, and five by six at bottom. The upright sides should be placed together across the street, when there would be a fissure two inches wide at top, between each row, also running across; and this should be filled in with two-thirds cement, and one-third of very coarse ground granite, mixed well together. The top of each stone should be perfectly flat, in which case the pressure at all times must be perpendicular: for when rounded at the top, the pressure must be at the opposite bottom edge, at the first instant of pressure of a wheel passing over: and this is the cause of all such pavements becoming loose, &c.; in which I think your correspondent Mr. Baddeley will agree with me.

Yours, respectfully,
G. L. S.

Enfield, June 28, 1832.

ARCHERY.

Sir,—In No. 460, there is an extract from a work on archery, specifying a variety of woods fit for making bows. The botanical history of very few of them is before the public in a tangible form, a thing much to be regretted, as well as that of many species of wood used in cabinet-making. Shooting with the long bow is an admirable gymnastic exercise, and ought to be encouraged by all those desiring health, in preference to many others which are pursued with enthusiasm. It is far preferable to billiards, or bowls, or skittles, and other similar pursuits But I never could find any reason, save the interest of the bow-makers, why bows should be constructed of wood. Cross-bows are always made of steel; why, then, should not long bows also be made of steel? The bow-makers say, that wood casts up quicker than steel; but I suspect that the "casting up" has more to do with the cash return than with the flight of the arrow. Wooden bows must suffer deterioration by age and by use. By age, a chemical change takes place in the wood, the moisture and oily particles departing and leaving it brittle. By use, the fibres of the inner side get pressed together and shortened, and the fibres of the bark get strained and lengthened, losing their elasticity, and the bow thereby gets a set and loses power. This having been found to be the case, "back bows" were invented, composed of two different kinds of wood glued together, the inner being elastic and brittle, and the outer tough; that is, with a fibre bearing an end strain. An extra elasticity is by this means given to the wood, the back being slightly shorter than the front; but the glue is apt to fail, especially in damp weather, and that—makes work for the bow-makers. Now, with steel, the elasticity is always alike; the bow which was good in the year 1800 will be equally good in the year 1900, if kept from rusting, without requiring to be softened in lard, as the bow of Ulysses was served by his wife's suitor. A steel bow might be very light, though not so light as one of wood, and should have a central hand piece. It might either be varnished or plated with silver, as a security against rust. Spring-steel spurs are plated. Wooden hoops for children are now obsolete; and hoops of round iron-wire reign in their stead. Why then should not steel bows take the place of wooden ones, the materials for which can be with difficulty procured, and only at a considerable expense? It is a remnant of savage life to use wooden weapons. In the infancy of the arts wooden clocks were used; but no one who values his time guides his movements by a wooden clock now-a-days. Savages use wooden swords at times; but civilized people use only those of steel. Metal wheels have "broken all the spokes and fellies" from those of wood; spigots and faucits have given place to patent brass cocks; shops are shut up with lifting iron shutters; even bedsteads of wood have paled their attractions before those of painted iron and gilded brass which promise no bugs; and no respectable man dies without spurning at an "elm great coat," and leaving word in his will to bury him in a patent iron coffin. In the name of all the arts then, let bows join in the general improvement, and take their proper standing in refined society, by changing wood for steel.

I am, Sir,
Yours truly,
JUNIUS REDIVIVUS.

THE SLIDING-RULE.

Sir,—Your readers have been led to expect from my pen an elementary treatise on the sliding-rule, in a compact form. Mr. Bevan has lately informed me that the edition of his treatise being nearly sold, he has prepared a shorter and less expensive work for artificers, confined to such problems as can be solved by the common carpenter's rule. Since it must be indifferent to the public by which of us its wants are supplied, and Mr. Bevan is by courtesy (apart from any question of copyright) entitled to the priority, I willingly leave the matter in his hands.

I am, Sir,

Yours obediently,

J. W. WOOLLGAR.

Lewes, June 27, 1832.

Street-Paving.—Institution of Civil Engineers, May 15.—Some allusion was incidentally made to the present imperfect condition of the London street-pavement in several situations, and an opinion expressed in favour of having the stones considerably narrower on the top; if limited to a breadth not exceeding five inches, it would probably be the means of preventing the accidents arising from the slipping of horses' feet, and supersede the necessity of having the stones grooved on the surface, an expensive operation, which has been resorted to on Holborn-hill, and other places, for this very purpose. *Athenæum.*—The "opinion" expressed by this respectable Society was but the echo of a suggestion made by a correspondent of this journal a week or two before, (No. 455, for April 28, 1832), and on which Mr. Baddeley, who was the author of the grooving plan, offered some strictures in No. 456, which appeared to us well deserving of attention.

Air-Carriage.—A gentleman in the neighbourhood of Northampton having constructed a small model for applying the power of condensed air to lathes, &c., and hearing that Mr. Fordham, of London, had succeeded in producing a more powerful engine for propelling carriages, communicated with Mr. Fordham on the subject, the result of which will be interesting to scientific men. Mr. Fordham's ingenious plan consists of two air-cylinders, with connecting-rods, communicating the power of cranks to the wheels. The recipients may be placed under the axle, or in the body of the carriage. When the air is condensed into the recipients, it will remain there for months with unimpaired elasticity. Each recipient is 12 inches in diameter by 54 inches long; capacity 34 by 10 feet, into which 170 cubic feet of air may be compressed. The expense of drawing coaches by horse is about two shillings per mile, and by condensed air it would probably be sixpence, and in many cases only fourpence. In 1823, the number of miles ran by the stage-coaches in England, exclusive of the mails, was 33,199,000; and the probable number of miles run by stage-coaches, including the mails, is annually about 40,530,000. The cost of the horse-keep to the country is about £4,000,000 per annum, of which £3,000,000 may be saved, and in making this saving not a man need be thrown out of employment, and a very improved method of travelling would be introduced. *It is probable steam-carriages will succeed eventually, but gentlemen will, no doubt, prefer a clean and elegant air-carriage to one propelled by steam.—Northampton Free Press.*

Hydraulic 'Self-Acting' Engine.—Mr. Charles Doyne Sellery has invented a new engine, which he terms the "Hydraulic Self-acting Engine." It works by the pressure of the atmosphere, and is said to possess a power equal to six times that of the steam-engine! Another remarkable character of this powerful engine is, that it neither requires fire, wind, nor water; and when once set going, works without any assistance whatever!—*Exeter Flying Post.*

Cotton Asparagus Beds.—It is recommended to form asparagus beds by means of very low-priced cotton, whence, it is stated, an astonishing produce may be derived. Silk and wool will, it is said, produce the same effect.—*Northampton Free Press.*

New Percussion Gun.—At the Royal Institution, last week, Mr. Farraday produced a new fowling-piece, possessing a curious principle of percussion. This gun is the invention of Mr. Wilkinson, conjointly with Mr. Moser, who has obtained a patent for it. The principle consists in the introduction of the priming into the barrel, and firing it in that situation at the *top* of the powder. The priming being fixed in the wadding or shot cartridge, is struck by a fine steel pin, which passes through a sheath or tube, surrounded by the gunpowder; and the advantages are, that no operation of priming is required, that being done in the act of loading; there is no flash or smoke, it is perfectly water-proof, and not liable to miss-fire; and the whole charge of powder must be ignited in consequence of being fired from the top and exactly in the centre.

Extraordinary Railway Performances.—On the occasion of a scientific gentleman lately visiting the Liverpool and Manchester Railway, some very extraordinary performances were effected. On two occasions, a load amounting to 100 tons was drawn by one engine from Liverpool to Manchester, a distance of above 30 miles, in an hour and a half, being at the average rate of 20 miles an hour. An eight-horse waggon on a common road, is capable of carrying only eight tons a day. Consequently it would take 100 horses working for one day on a turnpike-road to perform the same work as was here accomplished by a single steam-engine in an hour and a half on the rail-road. It is said, that no further performance on the rail-road has come near this result.—*Liverpool Paper.*

INTERIM NOTICES.

We regret that Mr. Crow's vindication did not reach us till after the Number for this week was made up. It shall appear in our next.

Nos. 1, 2, 3, 4, 5, and 6, have all come safely to hand. The continuation, at the writer's earliest convenience, is respectfully requested.

We shall write in a day or two to H. M. and T. C. of Derby. As they have not given a very exact address, it may perhaps be necessary for them to apply at the post-office.

The introductory paragraph of the letter of Junius Redivivus on American Rifles (p. 179) would have been better omitted, but "A Reformer not run Mad" must perceive that to insert his letter would only lead to the very sort of discussion which he deprecates.

Communications received from Mr. Pilcher—T. T.—Mr. Rontree—Mr. Ranwell—G. L. S.—Dunbar—Φ. M.—A Country Farmer—Mr. Marsh.

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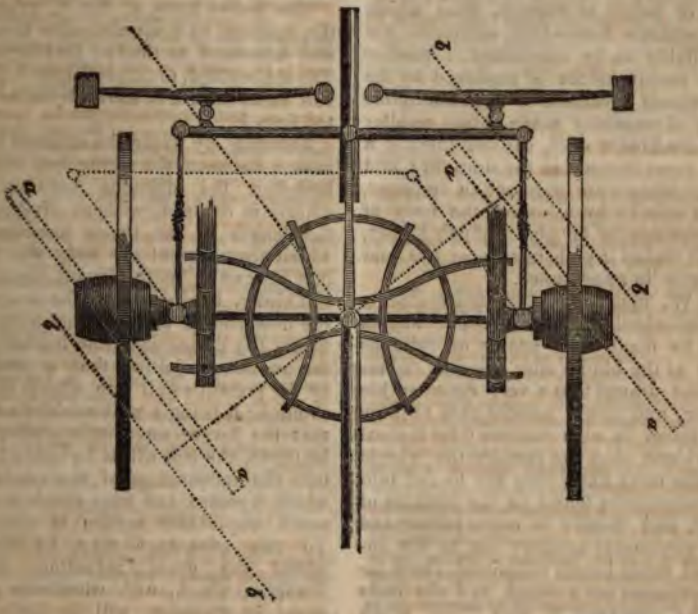
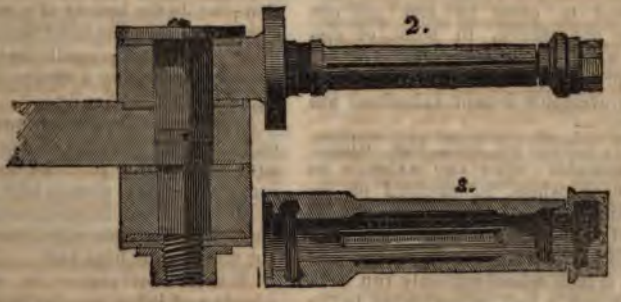
No. 465.] SATURDAY, JULY 7, 1832. [Price 3*d*.

MASON'S PATENT IMPROVEMENTS IN LOCKING THE FORE-WHEELS OF FOUR-WHEEL CARRIAGES.

Fig. 1.





MASON'S PATENT IMPROVEMENTS IN LOCKING THE FORE WHEELS OF FOUR-WHEEL CARRIAGES.

(Communicated by the Inventor.)

It has long been acknowledged, that the present mode of locking the fore wheels of four-wheeled carriages from the centre is very unsafe, and many times the cause of serious accidents. This arises from both the fore wheels being fixed or mounted to the same axletree; the consequence is, that when wheels so attached are locked, the four wheels form little more than three bearings, or points of support, from which circumstance four-wheel carriages are very liable to be overturned. Another great inconvenience is produced by the fore wheels so attached to the axletree being of necessity made much smaller than the hinder ones, causing thereby a very great increase in the draught; and if such wheels are increased in diameter, it can only be by allowing the body of the carriage to be placed much higher, which makes it both unsafe for use and inelegant in appearance.

In W. Mason's patent improvements on four-wheel carriages the fore wheels may be made very nearly or quite as large as the hinder ones, thereby reducing the draught in a very considerable degree, and giving greater ease to those who travel in such vehicles; for it must be evident, that the smaller the wheels are, the more likely they are to fall into the inequalities found in the surfaces of roads, and thereby to cause jolting and very unpleasant motion; but in the improved mode herein submitted, these inconveniences are avoided, and the body of the carriages is also hung much lower, and in consequence it is more convenient to enter in and get out of; the appearance, in point of elegance, is also much improved.

The principal advantages arising from the improvements herein submitted are as follow:—

Firstly, instead of both fore wheels being mounted upon one axletree as usual, each wheel is mounted on an arm, which arm is jointed to the end of the fixed axletree, by which means each wheel locks so near its own centre, that a 3 feet 6 inch wheel will only run back *one inch and a half* when locked to the utmost extent required. Wheels thus mounted can never be placed under the body of the carriage, as they are in the usual manner, when locked from the centre, by which means the carriage is, in many instances, placed on three points of bearing only, from which cause so many accidents occur by the overturning of carriages, when the fore wheels are locked; but in the improved construction, the fore wheels, when locked, never pass under the body, but always, and in every position, present four points of support, even when locked to the utmost extent.

The dotted lines *a*, Fig. 1, represent the axletree and wheels, with the new and improved method of locking them. The old method, of turning upon a pin or bolt in its centre, is shown by other dotted lines *b*.

Secondly, by fixing the axletree in the centre, between the spring-bed and the horn-bar, the distance between the wheels is reduced, without diminishing the length of the upper carriage; by which arrangement the body will hang in a better and more elegant position.

Thirdly, by increasing the height of the fore wheels, and making them very nearly the diameter of the hinder ones, the unpleasant jolting that is produced by the present small fore wheels will be avoided; it being a well-established fact, that the larger any carriage-wheel can be made, the less will it be liable to fall into the inequalities of the roads over which it passes, and from which cause so much unpleasant motion is produced. To this advantage may be likewise added the great reduction in the draught; which, with wheels so nearly equal in diameter, will be little more than half what it is in the old construction; while the beauty of a carriage constructed in this improved manner will be greatly increased; small fore wheels at all times producing a vacant appearance when viewed externally.

Fourthly, by fixing the swinging bars on joints, the draught of the horses are equalised in any position; and in turning, each trace is always kept tight.

Fifthly, these improvements can be applied to any four-wheel carriage without altering the hind part.

New contrivances for oiling the wheels and joints are also introduced, by

which means carriages will run many thousand miles without oiling. These will be sufficiently understood by reference to Figs. 2 and 3.

Fig. 2 is an elevation and section of one of the improved arms and the joints by which it is connected with the axle-tree.

Fig. 3, section of the improved box. Both the arm and the joints have cavities in their centres to contain oil, which passes through a side hole in each, to lubricate the box, the arm, and the joint, and one oiling will last for years.

W. M.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Second Annual Meeting.

(Concluded from our last.)

On Friday, 22nd June, the Association assembled in the theatre, at one o'clock, when reports from the Sectional Committees were read by their respective chairmen.

Mr. Duncan stated, that there had been laid upon the table some curious papers from the Ashmolean Museum, recording the early proceedings of the Oxford society of learned men, which, according to the opinions of some, was the origin, and, of others, an early branch, of the Royal Society.

An abstract of *Sir David Brewster's* report on the progress of optical science was read by *Professor Powell*, of London.

Mr. Johnston read his report on the progress of chemical science, especially in foreign countries.

Professor Powell read his report on our knowledge of the phenomena of radiant heat.

Mr. W. Conybeare gave an account of the nature and objects of his report on the recent progress of geology.

On the morning of Saturday (the last day of meeting), the general committee met at half-past nine, and various prospective arrangements were made respecting the proceedings and constitution of the Association. Meetings of the sections were also held as soon as the business of the general committee permitted. At one o'clock the President took the chair in the theatre, and read reports of the proceedings of the different sections during the week.

Mr. Brunel then being called on by the President, gave a history of the attempt made to carry a tunnel under the Thames, which he illustrated by a number of drawings and models.

Mr. Whewell gave a sketch of his report on the recent progress and present state of mineralogy.

An essay, by *Dr. Pritchard*, on the application of philological inquiry to the physical history of man, was read by *Mr. Conybeare*.

The *Marquis of Northampton* said, he had been deputed by the general committee to propose a resolution expressive of the gratitude they all felt to the members of the University of Oxford for the very great kindness with which they had received the Association, and the attention they had shown it.

Sir David Brewster having seconded the resolution, it was carried by acclamation.

The *President* announced that the Managing Committee had unanimously resolved, that the next meeting of the Association should be held at Cambridge, towards the latter end of the month of June, 1833—probably a few days after the Oxford commemoration; and that Professor Sedgwick should be invited to undertake the Presidency.

Professor Sedgwick said, he would accept, with pride, the honour which it was proposed to confer upon him; but, before speaking of the future, he must advert to the large debt of gratitude which they owed to the distinguished individual who had officiated as President on the present occasion. He was happy in thus publicly thanking him for the delightful manner in which he had presided over the meetings of the Association. All who were present had witnessed the exercise of his great powers, combined with extraordinary tact and temper, so that, through his governing influence, the jarring elements of a society, not yet organized, had been brought to order and harmony—and, during the long philosophic banquet of which they had been partaking, all seemed to have been living in intellectual sunshine. To succeed to such a distinguished person in so high an office as the one to which, by the voice of the Association, he had been raised, added no small weight to the responsibility thus imposed upon him. It would, however, at all times, and in all situations, be one

of his greatest pleasures to do any thing tending to promote the advancement of the British Association; and so far as his means extended, he was willing to give any pledge for the performance of so delightful a duty. With the task imposed upon him he might well be overwhelmed, did he not feel confident in the co-operation of very distinguished members of the University of Cambridge, possessing much greater powers than his own; and did he not believe that, before the next anniversary, the organization of the Society would be so complete, that his duties would be light compared with those of the present President. Studies, such as had occupied the Society, and consecrated by such a meeting, tended to elevate and purify the mind, and to produce those ennobling moral and religious sentiments which engendered mutual friendship, mutual forbearance, mutual kindness, and mutual confidence. They kept down to the utmost every bad feeling—and caused those which were good to germinate with the greatest luxuriance that was compatible with our nature. Having said thus much, with respect to his own individual feelings, he was sure he had the sanction of every Cambridge man, met within this University, when he said that they would do the utmost in their power to welcome the Association. They might not be able to rival the splendour they had witnessed in Oxford; but they would do their best. It would be the duty of every resident member of the University of Cambridge, as he was sure it would be his inclination, to receive the meeting, not merely with the forms of courtesy, but to extend to them the right hand of fellowship, and make them all feel as if they were among their kinsfolk and brethren. In one respect, at Cambridge, they might have an advantage over this University. At the probable time of the next meeting, most of the under-graduates will have left the University—and, therefore, there would be a power of accommodation afforded, which would enable them to receive, within their college-walls, many, and he hoped most, of the members of the Association. In saying this, he anticipated a great increase of their numbers; and that, on future occasions, instead of hundreds they would be congregated in thousands. And now (turning to the gallery, in which many ladies were assembled), if he might dare to lift his eyes to that blazing crescent, which had decorated the meeting of the Society at Oxford, and stimulated them to new exertions, he would tell them that every one of them was included in the invitation—and that many of them might also be, for a time, accommodated within the college-walls. Should this glorious consummation be brought about, he should anticipate a change, the effect of which no one could contemplate without joy. He believed, that every thing that was good, and great, and amiable, in the institutions of the University of Cambridge, would, by the genial influence of such a visit, be more firmly cemented, although there was but too much reason to apprehend its *monastic* character would be shaken to its very foundations. (These sentiments were received with such applause, that the remaining part of the speaker's address, to the lady's gallery, was inaudible.) He concluded, by thanking the meeting most cordially for the honour they had conferred upon him. He looked forward with confidence and pleasure to the results of this union between men of common feelings and sentiments, who possessed one common object—the promotion of truth, and the improvement of mankind.

Professor Whewell then rose and said, that his services had been fully and freely given to the Association, and would be so given as long as they could be useful. He begged to invite to Cambridge all who had been assembled here; and, although the members of that University could not pretend to imitate the princely hospitality which they had received at Oxford, they would offer a welcome no less cordial. To Oxford men, indeed, upon whom the members of the University of Cambridge had always looked as brothers, they did not think any professions necessary; but they hoped that persons, from the other parts of the empire, would equally accept their invitation. They were desirous to see as many as possible: they asked for the company of all who were cultivators of science, or interested in its objects. He trusted all such persons had felt here that they were united by one common tie—the pursuit of truth; and, with so large and united a body of zealous and

active men, he might reasonably prophecy that the next meeting would be a worthy successor to the brilliant and successful one which was now about to close.

The *President* said, that the Association were now about to leave the splendid theatre in which they were assembled. They had already passed a resolution expressive of their gratitude to the University for the excellent accommodation afforded them; but he could not refrain from tendering his personal thanks, as President, to the Vice-Chancellor, and Heads of Houses, by whom they had been so kindly received and hospitably entertained.

The *Vice Chancellor* returned thanks, and said, that whilst the Association had for its object the promotion of science and truth, and was guided by those rules by which it was at present regulated, it could not fail to command the good wishes, the support, the respect and admiration of all classes of persons, and particularly of those who felt the benefits, and knew the advantages, of a liberal education.

The *President* then adjourned the meeting to the music-room, at nine o'clock.

In the evening, the music-room was crowded with members of the Association and with ladies; and a lecture, illustrated by large drawings, was delivered by *Professor Buckland*, on the fossil remains of a gigantic monster, the megatherium, which have recently been, for the first time, imported into England from South America.

Dr. Buckland began by stating, that the history of the animal was very remarkable. The megatherium is nearly allied to the sloths, a family whose structure is very anomalous, and has been misunderstood even by the immortal Cuvier himself. "Gentlemen," said Dr. B. "I cannot utter the name of Cuvier, and associate with it the term immortal, without being at once arrested and overwhelmed by recollections of mortality, melancholy and painful. We have at this moment to deplore, in common with the whole philosophic world, the loss of the greatest naturalist and one of the greatest philosophers that have arisen to enlighten and improve mankind. The names of Aristotle, and Pliny, and Cuvier, will go down together through every age in which *natural history* and natural sciences—in which philosophy, talent, and learning, and every thing which, next to religion and morality, gives dignity and exaltation to the character of man—shall be respected upon earth. I need not state to you how voluminous are the works of that exalted and most illustrious naturalist, whose recent and irreparable loss we now deplore. For nearly thirty years, he has been the leader of that branch of natural philosophy which comprehends the structure and relations of all the kingdoms of animated nature. It was the genius of Cuvier that first established the perfect method after which every succeeding naturalist will model his researches; which laid the foundation of that analytical process of investigation—of that most philosophical, and accurate, and uniform system of reducing every organ of every individual to a fixed and certain type—which will enable all his followers to extend their inquiries over the boundless regions of the organized world. He has shown that the frame and mechanism of every animal present an uniformity of design, and a simplicity of purpose, which prove to demonstration that every individual, not only of existing species, but of those numerous and still more curious species which have lived and perished in distant ages, and our knowledge of which is due to discoveries in geology, was framed and fashioned by the same Almighty hand, and were designed and contrived by the same Almighty mind. Gentlemen, to this great and good man not only are the sciences of natural history profoundly indebted, but the higher science of morals also owe a debt of deep and everlasting obligation, inasmuch as he has proved to demonstration, the high and solemn truth to which I have alluded, the unity and universal goodness of the great Creator. Of this great man, gentlemen, torn away from us by the mysterious and incomprehensible counsels of the Almighty, we now lament the loss. In the vigour of his mind, and almost in the vigour of his life, at the age of sixty-three, he has been called to an early grave, and the tears of Europe have not yet ceased to flow over his funeral. The gratitude of the great nation to whose philosophic fame his genius has added so bright a wreath, has already displayed itself by a liberal provision for his family, and has fixed his widow, during the remainder of her mortal life, in that ho-

noured and well-known mansion, the *Jardin des Plantes*, which, during a quarter of a century, has been ever open in friendly hospitality to every son of science assembled at Paris, from every nation under heaven. The French nation have placed her there,—a brief and perishable monument of their gratitude. They have resolved also that a splendid and more lasting monument shall be raised to her immortal husband, and have invited the whole philosophic world to partake in the honour of contributing to its erection. He has raised to himself a monument 'ære perennius,'—a monument which shall endure even when the pyramids are crumbled into dust. This does not, however, absolve us from the pleasing and pious duty of contributing our humble share to that monument of stone which a grateful nation and a grateful world are about to consecrate to his memory. Gentlemen, I fear my feelings of respect, and love, and gratitude, have transported me beyond the limits which the task I have undertaken should impose on me; still I cannot but rejoice in the opportunity which this august assembly affords of inviting you to partake in this great and glorious work, and thus publicly recording your gratitude to that immortal man, whose friendship I have ever counted among the most distinguished honours of my life, and whose genius will, even by those who have not enjoyed this high and distinguished privilege, be ever venerated as their guide in the paths of science, so long as science shall be cultivated, or virtue venerated, upon earth." Returning to the subject of the lecture, Dr. Buckland said, that this monstrous animal, the megatherium, or "great beast," had been brought to England by Woodbine Parish, Esq., his Majesty's Consul at Buenos Ayres. He proceeded to illustrate the peculiarities of its structure and mode of life, by reference to the peculiar and most unusual organization and contrivances of its skeleton. This animal, and its kindred monster, the sloth, have been considered by all naturalists to afford the greatest deviations from the ordinary structure of quadrupeds, — deviations which they have always viewed as indicating an imperfection in this organization without any compensating advantage. The object of the lecture was to *show that these* anomalous conditions *and deviations are*, so far from being attended with inconvenience to the class of animals in which they occur (an opinion which has been entertained even by Buffon and Cuvier himself), afford striking illustrations of those rich and inexhaustible contrivances of nature by which the structure of every created being is precisely fitted to the state in which it was intended to live, and to the office which it was destined to perform. The peculiarities of the sloth, which render its movements so awkward and inconvenient upon the earth, are adapted with peculiar advantage to its destined office of living upon trees, and feeding upon their leaves. The peculiarities of the megatherium are not less wisely adapted to its office of feeding upon roots; his teeth, though ill-adapted for the mastication of grass or flesh, are wonderfully contrived for the crushing of roots, with the further advantage of keeping themselves sharp by the very act of performing their work. The fore feet, exceeding a yard in length and a foot in breadth, were armed with three gigantic claws, each more than a foot long, rendering them a most powerful instrument for scraping roots out of the ground. The colossal proportions of the hinder part of the animal are calculated to enable it to occupy one of its fore legs in digging, while the other three supported the weight of the body. Another peculiarity consists in the fact of its having been armed with a coat of mail like the armadillo, and several other animals, which obtain their food by the act of continual digging in the ground. This coat of mail exceeds an inch in thickness, and in shape resembles an enormous barrel. The Professor suggested his opinion, that the use of this bony armour was to prevent the annoyance which this class of animals would feel without some such protection from the constant presence of dust and dirt, with which the act of digging and scratching for their daily food would otherwise fill their skins. The height of the megatherium was about eight feet, its length twelve; its anterior proportions comparatively light and small; its posterior proportions nearly double the size of those of the largest elephant. The object of this apparently incongruous admixture of proportions was to enable the creature to stand at ease on three legs, having the weight of the body chiefly supported by the hinder extremities, and one of its

fore paws at liberty to be exercised without fatigue in the constant operation of digging roots out of the ground. The Professor concluded by stating, that this was but one of the many examples afforded by comparative anatomy, of the inexhaustible richness of contrivances whereby nature has adapted every animal to a comfortable and happy existence in that state wherein it was destined to move; and added, that the researches of geology tended not only to afford similar examples of contrivance, indicating the wisdom, and goodness and care of the Creator over all his works, but afforded also to natural theology a powerful auxiliary,—showing, from the unity of design and unity of structure, and from the symmetry and harmony that pervade all organic beings, in the fossil world, as well as in the present, that they have derived their existence from the same Almighty and Everlasting Creator.

The *President* then spoke of the desire that had been felt by himself, and almost every other member of the Association, to hold their next year's meeting in one of the great commercial towns—and expressed his regret that the imperfect organization, which the Association has yet assumed, had rendered it necessary to suspend the accomplishment of this desire until the organization should be more complete, and the advantages of the present year's experience shall have been consolidated by meeting, next year, at Cambridge.

Professor Babbage then addressed the assembly,—"Gentlemen, I have wished to express to you a feeling which is common, I believe, to the members of both Universities, that, after we had arranged these annual meetings, which I hope will long continue, we should strenuously endeavour to bring to the aid of our theoretical knowledge, that practical knowledge on which the wealth of our country so much depends. I felt this, and I endeavoured to ascertain the feelings of those with whom I mixed on this occasion; and I will say, that the first and universal impression was, that it was important, upon many accounts, that the Association should unite every mind that was engaged in the pursuit of knowledge, or anxious for its success. I was particularly anxious for this, owing, as I do, a debt of gratitude for *much of* the in*formation I have received* from many of the manufacturing districts of this country, where I have learned to appreciate more and more those theoretical pursuits which, in our academic labours, we follow. I was one of those who, at the first moment, thought we should adjourn to some large manufacturing town; but I am now convinced, that there would be fewer difficulties in our way, if that were for a time postponed. I hope those who are present here will, when they come into intercourse with either the manufacturing or commercial interests of this country, explain to them, that this postponement arises from no want of appreciating the value of their knowledge or pursuits, but from a hope that we may more firmly establish this Association and, by so doing, be enabled to cultivate with them a further acquaintance, which I am confident will be more advantageous to ourselves."

Mr. Murchison.—Gentlemen, I beg leave to propose a motion of thanks, by acclamation, to an individual who has been mainly instrumental in bringing us together here. At our first assembly at York, when this Society was in its infancy, and every difficulty hung around us—when our ultimate success so essentially depended on the place to be appointed for our next meeting; at that moment a professor of this University, conscious that he would be supported by that august body of which he is so bright an ornament, stepped forward with the greatest moral courage, and, on his own responsibility, asserted, that this great University would open its gates to receive us. I allude to Dr. Daubeny, to whom I therefore assert, we are indebted for the consolidation of our Association. Delighted as I have been, in common with all my scientific friends, with the cordial reception we have experienced, and which so well corresponds with the character of this University, I feel that, before we separate, we ought to record the sense of our deep obligation to that individual who has been the primary cause of our gratification; and, therefore, I call upon all my scientific friends, who have participated in the hospitalities of this place, and who have witnessed the zeal for science which animates the Vice-Chancellor, and other distinguished persons of this University, to declare, in the face of this enlightened assembly, their acknowledgment of gratitude to Dr.

Daubeny, who first proposed that the British Association should assemble at Oxford.

Dr. Daubeny, in returning thanks, observed:—"For my own part, circumstanced as I am, it is but natural that I should regard, with peculiar interest, the progress of science, more particularly in this University; and that, with these feelings, I should regard the establishment of this Association, and its meeting in this place, with peculiar satisfaction. It is a satisfaction which I sincerely believe is calculated to form an important epoch in the history of British science, and which I hope will be to the scientific world what the sun is to the physical, spreading the light and fertility of science over every place it successively visits—and rivalling, as I trust it will, that great luminary, not only in the lustre, but in the regularity of its movements. For my own part, I am very far from considering myself as one of the planets which form part of this great system, but view myself as one of the humbler satellites, following, at a respectful distance, the orbits of such great stars of chemical science as a Dalton, a Prout, or a Faraday. Still, however, though but a satellite, I hope I may continue obedient to the attraction of that body of which I form a humble part; and I trust I shall absorb some few of those beams of knowledge which it radiates so brightly all around it. I trust that the revolution of this Society may be considered as the great year of science; and that like the Pythagorean year (to which, perhaps, in the presence of such an audience, it may not be pedantic to allude), when the revolution of the Society is completed, and it returns to Oxford, all, whether they be planets or satellites of the system, will be found in their respective places—and that, in one respect only, the analogy may not hold good; for, whereas in the Pythagorean year, every thing returned to its former state, neither improved nor diminished; our Association, on the contrary, will, I trust, gather strength in each stage of its progress—and when it returns back again to this place, will be welcomed by a still more numerous and distinguished band of supporters."

The President rose and said, "Gentlemen, *the hour* reminds me that I must *admonish you that* we approach the adjournment of this most happy meeting. In conclusion, therefore, I congratulate this University on the compliment that has been paid it by the presence of so many distinguished and illustrious strangers, as have honoured us with their company on this ever memorable occasion. I congratulate the Association on the perfect harmony which has pervaded its meetings, and on the vast and inestimable utility that is likely to result from our operations. I congratulate the British nation that it possesses such a society, comprehending a host of individuals who are not only abundantly qualified, but prompt and ready to come forward and promote the interests of science and literature. I congratulate the scientific world that, not only in this country, but on the continent, there exist kindred associations, whose example has led to the meeting of this week. Gentlemen, I congratulate each individual here present on the attainment of what I consider almost the highest beatification of which we are capable in our present state,—the attainment of that personal knowledge and familiar intercourse which this meeting affords with those whose kindred minds and congenial pursuits have been long familiar to us, through the medium of their works; a meeting in which they whose heads and hearts we have from a distance long esteemed, and loved, and venerated, are thus brought close together in friendly and brotherly association; and permitted, though but a short, yet most delightful and most intellectual week of their existence, thus to hold sweet counsel and communion together, amid these our palaces of peace. Gentlemen, it is now my painful duty to announce the arrival of the moment of our separation; it is my more grateful task to add, that we are to re-assemble at Cambridge, in the latter part of the month of June, next year."

SIR JAMES HALL.

This eminent philosopher expired in Edinburgh on Saturday, June 23; and his death extinguishes one of the last of a bright constellation of genius and science which marked the commencement of the present century. Sir James Hall, who devoted himself, from his earliest years, to the cultivation of science, and became eventually the President of the Royal Society of Edinburgh, was the friend and

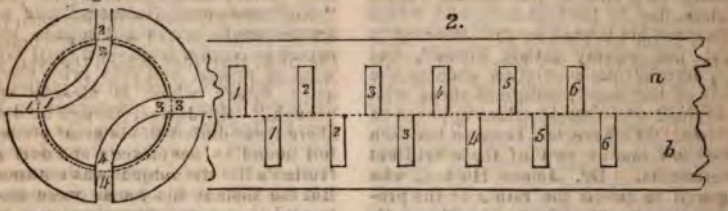
companion of Playfair, Wollaston, Davy, and of all the other prominent names of the day. He delighted to engage these master spirits in that amicable kind of controversy which has for its object the sincere purpose of elucidating truth. He was ever ready, at any cost of patience or labour, to investigate the foundations of his opinions by the rigorous test of experiment. In this walk of philosophy he rendered himself particularly remarkable, not merely by the boldness and originality of his conceptions, and the penetrating sagacity by which he anticipated consequences, but by the ingenuity with which he devised his trials—so that the results might not merely satisfy himself, but carry irresistible conviction even to the minds of the most resolute of those who maintained scientific doctrines opposed to his own. We have not room to instance more than one or two of these brilliant experiments. Dr. James Hutton, who may well be called the father of the present system of geology, in his well-known Theory of the Earth, had asserted, that the great class of rocks, called trap or basalt, owed their origin to fire—or, in other words, that they must at one time have been in a state of fusion, like melted lava, with which, in fact, he conceived them to be identical. The opponents of this theory said 'this cannot be true, for, if we melt a piece of basalt, it becomes, on cooling, a mass of glass, not of stone—therefore it can never have been in a state of fusion.' Dr. Hutton at once perceived the want of keeping between the experiments tried by his opponents and those stupendous operations carried on by nature, and he reasoned thus—"If nature melts a mass of rock of great extent, it will, as a matter of course, cool very slowly. We cannot imitate nature in the scale of her proceedings, but we may in the rate at which she works." This argument the author of the theory considered sufficient. But his pupil, Sir James Hall, led, we believe, by some circumstances connected with melted lava which had fallen under his own observation at Vesuvius, determined to try what could be done. He accordingly took a piece of basalt, melted it, and, in the first instance, cooled it rapidly. It became glass, as he had expected. He now melted this piece of glass; but instead of allowing it to cool quickly, gave it several hours, and, in some cases, many days, to adjust its mysterious arrangement of crystals, and, in the end, it came out a mass of stone, so identical with the original rock, that the closest scrutiny could scarcely detect the difference. In this manner it was denied that Dr. Hutton's igneous theory of lime-stone could be founded in fact, since even a moderate temperature drives off the carbonic acid, and leaves only quick lime, an infusible material. "Very true," said Dr. Hutton; "but why should we suppose that nature will permit the carbonic acid to fly off? Who knows but it may act as a ready flux to the quick lime, when heated and forced to remain in union with it, under an adequate degree of pressure from the superincumbent ocean."—"Let us reduce this also to the test of experiment," said Sir James. "No," answered Hutton; "our means are too small—we cannot hope to imitate nature on such a scale—we shall fail for want of power, and thus bring discredit on a theory which is already strong enough." Sir James, though he did not share these doubts of his great preceptor, felt bound to acquiesce; and during Dr. Hutton's life the subject was not touched. But the instant his hands were free, to work he went, and after a series of varied trials, which furnish some of the most beautiful examples of experimental philosophy any where to be met with, Sir James succeeded in confining the carbonic acid so effectually, that out of a common oyster shell, he formed, at a heat not greater than that of melting silver, such perfect specimens of marble, that an experienced ornamental carver in stone exclaimed, when he saw one of the specimens, "If the quarry from which this marble has been taken is near a great town, it will prove a mine indeed!" We could quote many instances of his sagacity, ingenuity, and perseverance, and we particularly regret that we have not room to do justice to Sir James Hall's Theory of Gothic Architecture, of which every body has heard, but which hardly any have ever had the means of fairly understanding; for the work, by some mismanagement, was made so expensive that it still remains far beyond the reach of those by whom it would be most appreciated. We trust that, ere long, we shall be favoured with a volume containing a connected series of Sir James's discoveries.

None of his papers, indeed, run to any great length; and even his elegant and extremely popular architectural speculations might easily be condensed into a compass suitable to the taste of the present day. The conversation of Sir James was highly valued by the distinguished persons with whom he associated. His ingenuity, however, and his vigorous power of generalizing, great though they undoubtedly were, remained at all times subordinate to his love of truth; and,

what was still more rare, his ardour in the pursuit of knowledge, and his irrepressible eagerness in seeking to convince the minds of others, never once disturbed his own equanimity, nor left the slightest trace of pain on the feelings of the most sensitive of his company. Every person, indeed, who enjoyed the pleasure of his society will bear us out in this praise; but it is only those who lived with him in the close and familiar intercourse of domestic life, who can duly bear testimony to that unequalled stability and sweetness of disposition, as well as generosity of purpose, which were so constantly present to his thoughts.—*Correspondent of the Times.*

MR. RONTREE'S STEAM-ENGINE VALVES.

Fig. 1.



Sir,—Permit me to observe, that the remarks printed at the end of your 457th Number on my steam engine valves (vol. xvi. p. 377), are so far from the truth, that I fear the person who troubled you with them, either knows very little about steam-engines, or is so prejudiced against improvement that he cannot see it when plainly pointed out to him. He tells your readers that *he* cannot see any difference, either in principle or action, between my invention and the cock. He does allow, that it will prevent the condensation of a few inches of steam at each stroke, but contends that this is more than balanced by the very extended surface and the impossibility of keeping the valve in order. If he perfectly understood the action and construction of the fourway-cock, and was acquainted with the loss of steam which takes place at each stroke, from the absurd, although necessary construction of the nozzles of the cock, as well as with the inconveniences of the short slide-valve, he would not have ventured such assertions. He would have seen, that the principle, and particularly the action, of my valve, differ most materially from the cock, insomuch that a port of from 1 to 20 square inches can be procured by shifting the hoop only one inch, or even less; besides, no more of its surface need be made to pass the port, than is found necessary to form a sufficient overlap. On the other hand, it *is well known, that the* cock must travel *over a surface equal* to half of its own circumference before effecting one revolution of the crank-shaft, and that the whole of its surface (on a line with the ports), must pass them twice during that operation. All this is sufficient to account for the wear and tear and the great difficulty of keeping the cock in order. The prefixed sketches are meant to illustrate this argument more fully, and will serve not only to show the superiority of my invention over the cock and short slide, but to contradict the assertions of your correspondent.

Let fig. 1 represent a fourway-cock; draw the figure on a card, and place a pin in the centre; then cut out the centre piece by the dotted line; shift the ports, that is, turn 1 to 2, &c., and it will pass over one-fourth of its circumference, and bringing the numbers where they were, will cause it to have passed over one-half of its circumference. It will be observed, at the same time, that each quarter passes completely over its respective port *twice* in that operation. Fig. 2 is an elongated view of my hoop or valve (it will be here necessary that the reader should refer to my original drawing, vol. xvi. p. 377); draw this figure also on a card, and suppose the ports to be one-half inch wide and one-half between; cut it by the dotted line; shift the part *a* one inch to the right, and the ports will be open; then return it; and they will be closed as before, with one half-inch of overlap on each side. It will also appear that one-third of the surface between

the ports never comes in contact with them. I find that the necessary surface of my valve will not exceed 16 square inches on the eduction side of each; and certainly no objection will be made to the friction arising from the steam-way side the surface of a slide-valve; for such a cylinder as I have in view will not be less than 22 or 24 inches, so that the difference is trifling. Perhaps your correspondent meant the *whole* exterior of the hoop to embrace the recess! If he did, it would only square with his other ideas in absurdity.

This letter has already extended rather too far; but, while my hand is in, allow me to say that I consider my invention to possess advantages far beyond any other valve ever applied to small engines. These are, 1. the saving of steam from the dismission of the nozzles; 2. the property of keeping the cylinder at all times clear of water; 3. the means afforded for increasing the eduction; and, 4. the introduction of the steam in a sheet rather than through one contracted orifice. Nothing appears more ridiculous than the application of these nozzles to a condensing-engine. We first generate steam at each stroke equal to their capacity above what we really require, and then extract the air to form a vacuum for its retirement! We also raise water to condense it, and, after all, we are content to extract it in water along with that raised for the purpose of condensation. There must be something decidedly wrong here.

I am, Sir, yours respectfully,

THOMAS RONTREE.

5, Canning-street, Liverpool,
June 26, 1832.

M'CULLOCH'S COMMERCIAL DICTIONARY.

This is a work* of a more elaborate and more permanent character than ninety-nine in a hundred of the flimsy "new books" which "come like shadows, so depart," in the course of a publishing season of the present day. The author takes pains to inform us, that the compilation of it has cost him three years of nearly continual application; a fact, which, although it might have been considered anything but extraordinary in the substantial folio days of our grandfathers, is cited as a phenomenon in these latter times, when three years are reckoned quite sufficient for the production of three leash of three-volumed novels, or a dozen poems, quite as long, if not quite so good, as "Paradise Lost." There is, however, a little jugglery in this assertion, which deserves exposure. Mr. M'Culloch may have been the time mentioned in collecting his materials; but then he made use of some of them long before he announced, or perhaps thought of the Commercial Dictionary, into which he has copied them by wholesale; the time, therefore, which the writing of these occupied, ought in all justice to be deducted from the much-vaunted three years. That Mr. M'Culloch has not made this deduction may be pretty safely inferred from the style in which they are dovetailed into the work—not as extracts merely, but without any acknowledgment whatever of their want of originality—without anything to lead the reader to believe they were ever in print before—in short, as original articles, in which the "we" is Mr. M'Culloch in the capacity of author of the Commercial Dictionary, and not Mr. M'Culloch as a contributor to a review, or magazine, or newspaper. Some of these articles are actually printed now, for the third time, as original! Thus we have a long memorial of the wine-growers of Garonne to the French government in favour of free trade, which coincides so completely with our author's views on the subject, and is consequently so great a favourite with him, that he inserts it in the thick volume before us, although it has before, twice at least, done him good service,—once in the pages of the Edinburgh Review, and once (but a few months ago) in his Treatise on Commerce in the Library of Useful Knowledge; and, worse than all, in all three places it flourishes in its pristine state and in its pristine language (the French), without an attempt at translation! Surely, in some part of the three years, this three-times-printed memorial might have been done into English, even if it were only for the sake of giving it a little novelty of appearance! It is quite bad enough for our novels and books of amusement to be disfigured by the paltry affectation of introducing scraps of French, or any other tongue, of which the writer may happen to have a smattering, without

* A Dictionary, Practical, Theoretical, and Historical, of Commerce and Commercial Navigation; illustrated with *Maps*. *By J. R. M'Culloch, Esq. London, 1832. 8vo. 1155 pp.* Longman and Co.

the practice being introduced into our books of information. It is too much the practice of the self-called friends of universal instruction to wrap their oracles in at least a partial unintelligibility, while they profess the wish to throw them open to all. Witness the conduct of that now chartered corporation, the Useful Knowledge Society, in gravely presenting the English mechanics, whom they are "labouring to enlighten," with our author's aforesaid second-hand Treatise on Commerce, in which whole pages are filled exclusively with French. The "learned" in the "good old times," endeavoured to preserve a monopoly of knowledge by writing only in Latin: the philosophers of our own day declare against this monopoly as hateful and intolerable; and yet they seem to have a hankering after its sweets, if we may judge from their works instead of their words; they still have a lingering wish that the republic of letters should consist of "select society." As Mr. M'Culloch has evidently made up his mind that his great work is to run through as many editions as Mrs. Rundell's Cookery, we hope he will at least take the trouble to translate this everlasting memorial in time for the twentieth, at any rate. The preface, too, might well be spared, as it consists of nothing more than a rather lengthy exposition of the faults of all previous Commercial Dictionary-manufacturers, and the superabundant excellencies of the present one. "Self-praise is no recommendation."

The contents of the work are, of course, sufficiently multifarious, although the author confines himself strictly to his subject, and does not, like some of his predecessors, wander into descriptions of the manufacturing processes used in preparing the articles of commerce. He only leaves details of bargain and sale to give topographical descriptions of the chief commercial cities and seaports of the globe. Among these we were rather surprised not to find any notice whatever of the greatest of all, London itself, or of the second commercial metropolis, Liverpool,—both rather strange omissions in an English work. On political economy, Mr. M'Culloch, as might perhaps be expected, is much more diffuse than is necessary, or than his subject called for.

By way of specimen of the staple material of the book, we shall quote what is given under the head "Hardware," which affords a fair sample:—

"HARDWARE.—(Ger. *Kurze waaren*; Du. *Yzerkramery*; Da. *Isenkramvarer*; Sw. *Järnkram*; Fr. *Clinquaillerie, Quincaillerie*; It. *Chincaglio*; Sp. *Quinquilleria*; Port. *Quincalharia*; Rus. *Mjelotzchnue towarii*) includes every kind of goods manufactured from metals, comprising iron, brass, steel, and copper articles of all descriptions. Birmingham and Sheffield are the principal seats of the British hardware manufactures, and from these immense quantities of knives, razors, scissors, gilt and plated ware, fire-arms, &c., are supplied, as well for exportation to most parts of the world, as for home consumption.

"The hardware manufacture is one of the most important carried on in Great Britain; and from the abundance of iron, tin, and copper ores in this country, and our inexhaustible coal mines, it is one which seems to be established on a very secure foundation. The late Mr. Stevenson, in his elaborate and excellent article on the statistics of England, in the Edinburgh Encyclopædia, published in 1815, estimated the value of all the articles made of iron at £10,000,000, and the persons employed in the trade at 200,000. Mr. Stevenson estimated the value of all the articles made of brass and copper at £3,000,000, and the persons employed at 50,000; and he further estimated the value of the steel, plating, and hardware manufactures, including the toy-trade, at £4,000,000, and the persons employed at 70,000. So that, assuming these estimates to be nearly correct, the total value of the goods produced from different sorts of metals in England and Wales in 1815, must have amounted to the sum of £17,000,000, and the persons employed to 320,000.

"There is reason to believe that this estimate, in so far, at least, as respects the value of the manufacture, was at the time rather too high; but at this moment it is most probably within the mark. There has been a very great augmentation of the quantity of bar and pig iron produced within the last fifteen years; and the rapid increase of Birmingham and Sheffield, as well as the smaller seats of the hardware manufacture, shows that it has been increased in a corresponding proportion. We have been assured, by those well acquainted with most departments of the trade, that if to the iron and other hardware manufactures of England be added those of Scotland, their total aggregate value cannot now be

reckoned at less than £17,500,000 a-year, affording *direct* employment in the various departments of the trade for at least 360,000 persons.

"Amount of the real or declared value of the different articles of hardware exported from Great Britain to foreign countries, during the year ended 5th of January, 1830:—

	£.	s.	d.
"Brass and copper manufactures -	810,641	2	0
Hardwares and cutlery	1,389,514	19	0
Iron and steel, wrought and unwrought -	1,155,176	15	0
Mathematical and optical instruments -	21,612	5	7
Plate, plated wares, jewellery, and watches	177,242	1	0
Tin and pewter wares, exclusive of unwrought tin - -	235,021	19	1

"The exports of the same articles during the year ended 5th of January, 182, were as follows:—

	£.	s.	d.
"Brass and copper manufactures -	653,859	13	5
Hardwares and cutlery	1,149,510	19	7
Iron and steel, wrought and unwrought (mathematical instruments not specified) -	924,448	8	1
Tin and pewter wares (exclusive of unwrought tin) - -	187,811	10	7
Total -	2,915,630	11	8
Increase of the exports of 1829 over those of 1819 - -	873,578	10	0

"The United States is by far the most important market for hardware and cutlery. Of the total value (£1,389,514) exported in 1829, they took no less than £669,871. The East Indies, West Indies, British North American Colonies, and the United States, are the principal markets for iron and steel."

Of articles such as this, interspersed with others on topography, &c., the work is almost entirely composed; and it will be seen that no small labour must have been required in collecting and digesting the details of imports and exports, although these are nothing in comparison with the elaborate tables of duties, &c., charged by the principal nations with whom the *English have commercial* connexion. As to the correctness of such a vast mass of information, we cannot be expected to bear any very decided testimony: from what we have observed, they appear to have been compiled with great care and attention; but many mistakes, doubtless, *must* have crept in. We were rather surprised at the out-of-date air of the article on the Post-office, which was evidently written before the Duke of Richmond's alterations, and is scarcely correct even as to the ancient state of affairs. The article on Publishing is a second-hand one, being, in fact, almost verbatim the very same which made some noise when it first appeared, about six months ago, in the Edinburgh Review. We can hardly wonder, however, that our author should have avoided as much trouble as possible, when we cast a glimpse at the excessive smallness of the type in this eleven-hundred-paged volume (especially in some parts), and consider on what a vast variety of matters he was required to treat: as, for instance, under the letter C, and only part of it, flourish, among a mass of others, the contrasted subjects of "Cables, Cacao, Cadiz, Cajeput oil, Calcutta, Calico, Camel's hair, Canals, Canary-seed, Candlesticks, Canton, Capital, Caravan, Carts, Cassia, Cardamoms, Carmen, Catechu, Cat's eye, Cattle, and Certificates." The work is, as the title-page states, "illustrated by maps," but these, unfortunately, are so very shabbily got up, as to be a drawback rather than a help to the book. They are engraved it is true, by Sidney Hall,—our first engraver in the line; but the artist has not been allowed room for his strength: they are, in fact, mere outlines, with no attempt at shading (was it too expensive?); so that land and sea are alike indistinguishable, and half the utility, along with all the beauty, of the maps is quite lost; they are printed, too, on paper of a very thin and inferior description, quite beneath the character of that on which the letter-press appears. In other respects, the work, in all its mechanical departments, is exceedingly well got up.

CROW'S SEAMAN'S OCTANT.

Sir,—In the Mechanics' Magazine, June 16, p. 168, I find, under the head "Seaman's Octant," the figure of an

strument which, we are told, was invented seven years ago by a Mr. Heath. I am glad to find that your correspondent has taken so much notice of, and strong a fancy to, my child! That, however, is not to be much wondered at, because, says Mr. H., it is so *very much* like the one I conceived seven years ago. Nay, he goes on to state more—"that it is the *very thing itself!*" Why, Sir, those gentlemen, and those only, who are skilled in the knowledge of triangles, would be at all able to discover, by comparing the two drawings together, that they are *even* alike in *principle!* In every other respect, there is certainly not the slightest semblance.

It may not, perhaps, Sir, be generally known to your readers, that, by fitting up the seaman's octant with index and horizon glasses, it would be at once a Hadley's quadrant*—*improved*, say some people. But I have brass octants for the solution of cases in oblique-angled plane triangles, and which solve the various problems in right angles as well. The arch and semicircle are both engine-divided, to minutes, by means of their verniers; so that the greatest possible accuracy must, consequently, be obtained. This instrument must, therefore, be a *double* advantage, particularly to mathematical teachers of this branch of science. It would also be found exceedingly useful to other gentlemen, who have not perhaps time or inclination to wade through the tedious work of calculation. And what, Sir, if they had? Why, that the octant would prove in a few seconds, (provided that the case is properly stated), whether the work is rightly *thumbed* out, or detect any misprinted figure, or any mistake made in taking out the logarithmic sines, logarithmic numbers, &c.; and hence much fatigue and head-work would be spared, and valuable time saved. Your correspondent, it would seem, has got the weather-guage of me; having laid claim to *all the merit* of the invention, and also to *all the honour*, "such as it may be." He would doubtless have been fully entitled to all claims, had he only gone through the *fagging* part, as I have done, and, indeed, still am doing, with the view of getting the instrument properly before the nautical public. May I beg, Sir, to be allowed, through the medium of your valuable paper, to declare, that I never in my life saw or heard of any plan—neither have I seen in any book, any figure whatever—by which I could derive the least possible help to the construction of my seaman's octant.* The design of the octant is, Sir, *wholly my own*—founded on principles, the result of my own contemplations. The design, I have no doubt, suggested itself to me, from the circumstance of my having been some years at sea. I felt, from my own little practical experience, that such an instrument as the one produced by me, (needless almost to say) not without very *considerable* expence, and *hard work too*, would be found *useful* and *valuable* to all classes of seamen. The facility in its application will save time to the officer, who has to carry on the ship's duty, in working his day's work at noon. That this opinion of mine is supported by some of the first scientific and practical characters of the day, may be seen in my pamphlet, or book of directions. But how far my humble efforts will meet with *early* support, which is most desirable, from the scientific and nautical world, time alone can only determine. It is, however, most gratifying to add, that only within these few days, it has met with the kind and liberal support and approval of the Honorable Corporation of the Trinity House, who have favoured me with an order.

I am not aware, any thing more remains to be said by me, unless it be to express my sincere thanks to you, Sir, for the excellent and valuable notice of the "Seaman's Octant," (with a plate), which you gave in the Mechanics' Magazine, No. 254.

I am, Sir,
Yours, &c.

W. CROW.

37, Windsor Terrace, City Road,
June 27, 1832.

* Combining a Hadley's quadrant with the traverse-worker, was, indeed, my *first* intention; but, *for the extra charge, about £1*, I declined it. However, *should any person require the octant thus combined, I should be most* happy to make it so.

* Neither could I trace by the books at the Patent-office, that any instrument constructed for such purposes had ever been known there. I have been much engaged of late, otherwise I should have made my "vindication" *earlier*; although, for myself, I scarcely thought it required any. It must be perfectly obvious to every one, that Mr. H.'s plan would never do, in its present shape, to answer all the purposes my octant is designed for, and capable of performing.

DRAWING PAPERS.

Sir, — Your correspondent J. E. in a recent number (page 191) evinces so much desire to obtain what he calls *good* drawing-paper, that I am tempted to speak to the qualities of that production of art as now manufactured in England.

Drawing-papers are required by various artists of very distinct qualities to suit their mode of working. There is scarcely any two masters who agree as to the papers which are best adapted for painting on water-colours; and if they did, it is rarely that any paper maker, however celebrated, can turn out two lots of paper alike and equally good.

The chief consumption of drawing paper is for ornamental work of various kinds, as well in paper as in cards, card boards, drawing boards, &c., and for these purposes the finer the colour the readier it meets a market. To obtain this colour, all rags used for fine papers must undergo the process of bleaching by chlorine in some way or other. And, be it observed, this process, when well conducted and managed without using any admixture of lime or alkali, is not injurious to the texture of the paper, as all the acid is, from its ready affinity with water, clean washed off, without leaving a trace behind.

Drawing paper was formerly, and is frequently now, sized in such a way as to prevent the wetted colour from floating over its surface; in consequence of this, great labour is required to obtain the full tints when required, and should the artist venture to scratch the surface, it is in vain for him to soften down the tints by washing out, if too deep. To obviate this irregularity—for oft times one part of a sheet will float freely, while another resists the colour and works greasy—artists are compelled to resort to washing their paper with preparations of gall, sold under various names. This deadens and ruins some water-colours; which, by-the-bye, is the cause of the cake colours of some manufacturers losing their tone when dry, gall being used in the composition to make them work easily.

Pure water applied cold with a clean sponge, is the only means by which drawing paper should be attempted to be amended. Rubbing, scraping, and gall-watering will *do no good.*

It must be remarked, that paper is *more* transparent than it formerly was, unless where smalt blue is used in the making of it, which renders it more opaque.

The applicability of Indian or Chinese paper to copperplate-printing, arises from its having no size in its composition (it is useless for drawing upon) and from its being of long fibre, flexible, and well-cleaned of the gluten or harsh part of the material it is made from, by the *rotting* it undergoes previous to its being made into paper. When the rolling-press is applied, the wetted paper (Indian or Chinese) fills every fine line of the engraving, and takes out the ink from them on its surface, without breaking up, as English and even French plate papers will do, when nearly putrified by lying many days damped before printed; a way of working which copperplate-printers say, they cannot do otherwise than practise for very fine plates.

Many years ago, a coarse common drawing paper was placed in my hands manufactured in Italy—which was said to be excellent for artists. Desirous to show that such paper could be made in England, I tried to do it; after many costly and troublesome experiments I succeeded, and the same paper is now preferred to any other for landscapes.

It is rough on the surface, extremely free to work upon, without being too absorbent; should too heavy a tint be accidentally laid on in any part, it may be washed down with the greatest facility; when damped, or wetted with a sponge, and placed on the straining frame, it has the property of keeping the same dimensions when wet as when dry, thereby preventing cracking or breaking where it is united to the stretching board.

Flattered by the general approbation of those who used this rough paper, I then manufactured a smooth one, and rolled it by a machine of peculiar construction—the first attempt of the kind to render paper smooth without hot-pressing, and many years before the improvement of rolling paper was done by any other person.

My attempt to introduce smooth rolled drawing-paper, possessing the same qualities as the rough, was useless; at that time very few artists in flowers approved

of any thing but drawing-boards: to those articles, as of readier sale, I was, therefore, compelled to pay attention. I had the sorry satisfaction, when I had sold all my first and only making of improved smooth drawing-paper, to find it was greatly approved by some artists; but the small quantity wanted precluded my making a fresh stock, which would have required an outlay of many hundred pounds without an adequate return.

If your correspondent J. E., and others who consume drawing-papers, manifest a real wish for paper adapted for other purposes distinct from the rough paper I have produced for landscape-painting, and without being so rough, I feel confident that I can present such an article to the public, and I will most certainly devote my time to making the requisite experiments until I have attained what is really wanted. That my experience is of some standing will be seen by my noticing that it is a quarter of a century ago since my attention was first drawn to this desirable material for artists—"Good drawing paper."

Allow me, however, to add, that paper, however good, is useless, unless greater care is taken by painters in water colours to select their colours genuine and unadulterated than is usually done.

Painters in water-colours should never use *cake colours*. They are always sophisticated—often from ignorance, but frequently from fraud. Most of the materials, with which the various colours are made up into cakes, to ensure their adhesion when used, have a constant action upon the colours, and produce a quick and rapid deterioration of the fine tone and hue, which is apparent in a recently executed painting in water-colours. Even the alkaline properties of the saliva (this is noticed for those who have contracted the bad habit of putting their pencils in their mouths) will destroy some colours. Burnt gas, when used as light, and the fumes of smoked cigars or tobacco are also highly mischievous.

Dry colours kept in close stopped glass bottles should alone be used, for painting in water colours, with a solution in clean water (made at the time wanted, and not left to get sour or putrid) of gum arabic or gum tragacanth, of the purest quality.

The painter in oil prepares his own colours. Why, then, should the beautiful art of painting in water colours be endangered from want of the like care and industry?

Titian, it is well known, was as much occupied in practising to produce the finest colours as with his pencil.

I need only add, that dry genuine colours, by the pound or ounce, are much cheaper than when sold in cakes, and any adulteration is more easily detected

ONE WHO LIVES TO LEARN.

The Fancy Fair in the Surrey Zoological Gardens, for the benefit of the Fund for the Restoration of the Ladye Chapel, appears to have succeeded to admiration. We were, unfortunately, unable to avail ourselves of the ticket of admission, politely sent to us by the fair and accomplished Secretary; but we observe that all the newspapers agree in representing this as having been one of the best managed and most productive Fancy Fairs of the season. We congratulate the Ladies of Southwark on the powerful support which they have thus been enabled to give, to a cause so much identified with their own interests—the cause of taste, elegance, and beauty.

Mr. Loudon's Encyclopædia of Cottage Farm and Villa Architecture.—Part *Second* has just appeared. We have not yet had time to examine it, and only mention it, at present, for the sake of making at once known to our readers a change which has been very judiciously made in the size and price of this well-planned and much-needed publication. Instead of twenty 10*s*. Parts, it is now to be limited to ten Parts, at 5*s* each.

Newcastle and Carlisle Railway.—There is now a prospect of this work being speedily completed, as the Company have just obtained an Act of Parliament, empowering them to borrow £100,000, which they will receive of the Commissioners for authorizing the issue of Exchequer Bills in aid of public works.—*Tyne Mercury.*

Leeds and Selby Railway.—On Monday, the 25th of June, the general annual meeting of the shareholders was held at Leeds. From the reports it appeared that the works were proceeding in a very satisfactory manner, and that it was probable that in the course of next year the railway would be completed and in operation the whole length of the line.—*Hull Packet.*

Specific against Rats and Mice.—It is a fact not generally known, that tar rubbed on the holes of these vermin will immediately banish them. When it becomes dry it must be renewed.—*Country Paper.*

INTERIM NOTICES.

M. G. M. will find a full account of the mode of making microscopic globules in our 269th Number.

Communications received from Mr. Rough—Guilelmus—Mr. Hounds—Mr. Busby—H. H.—Mr. Pitcher—Mr. Shires—Dunbar.

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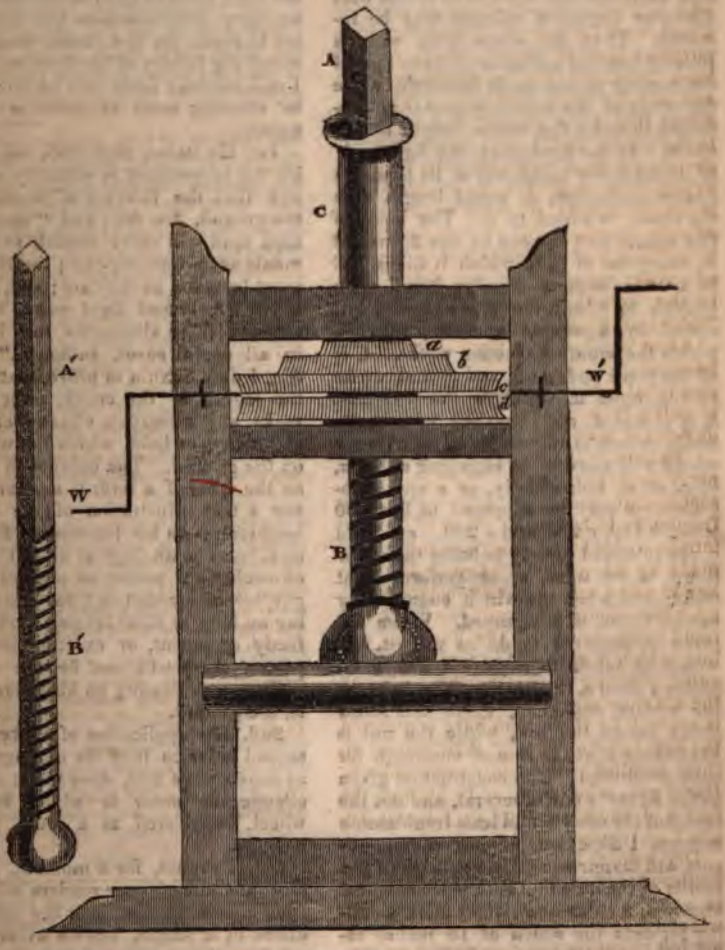
MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 466.] SATURDAY, JULY 14, 1832. [Price 3d.

HUNTER'S SCREW PRESS IMPROVED.



HUNTER'S SCREW-PRESS IMPROVED.

Sir,—I beg leave to submit to the consideration of your readers the following design for extending the range of an admirable invention, which must be familiar to most of them—I mean Hunter's screw-press. My principle is, instead of using Hunter's triple combination of nut and screw, to use only a nut and screw with a supplementary apparatus, which shall have the effect of making the screw, as it were, run away from the gripe of the nut, while the nut is made to follow with whatever degree of velocity may be required. Thus the screw rises with a velocity bearing a similar ratio to that of the moving power, as in Hunter's, while the range of the resultant power is continued through the whole length of the screw. In the accompanying figure, A′ B′ is the screw taken out of its place; a square projection, of equal length with the screw, is added to it. The head of this square part is seen in the figure, at A, rising out of C, in which it slides. C is a tube with a circular bore, wide enough to admit the screw freely, but closed by a square aperture, through which the square projection works. C is of one piece with *a*, *b*, and *c*, and works resting upon *d*, which is the real nut. *a*, *b*, *c*, and *d*, are furnished with teeth, and a winch is affixed by a contrivance which will allow of its engaging either *a*, *b*, *c*, or *d*, individually, or *c* and *d* together. *a* may be supposed to have 50 teeth, *b* 100, *c* 200, and *d* 200. *a*, *b*, and *c*, are intended merely to bring the screw down to its work, or to perform light tasks; and when the winch engages any one of them, *d* is clamped. When the screw is required to do its utmost, the winch is made to engage *c* and *d* together; then *c*, by means of its hold on the square projection, keeps the screw going before the nut, while the nut is overtaking it at the rate of one tooth for each revolution. The construction given in the figure is one of several, and not the best, but the one I found least troublesome to copy. I hope some of your correspondents will favour us with an opinion of the merits of the machine as thus altered, and also with a calculation of its powers, taking for data the winch at 15 inches radius, the moving power at 30lbs., as, also, that one revolution of the winch passes *one tooth*, and that one revolution of the *nut d passes one thread* of the screw, the interval between any two threads being 2 inches.

I am, Mr. Editor,
Your obedient servant,
Φ. M.

PRINCIPLES OF LOCOMOTION.

Sir,—Saxula has conceded so much in his late papers, that I was debating within myself whether I should offer any remarks thereon, when the appearance of Hezron's paper, page 56, determined me once more to intrude my opinions. I am sorry circumstances will not permit me to prove (in the literal sense of the word) the fallacy of his conclusions; but I still consider there will be no difficulty in showing some of them to be erroneous.

1st. He states, page 265, vol. 16, that his 8th proposition is virtually admitted, and that the fulcrum of locomotion is the ground, &c. &c., and "that a common road will never furnish such abutments as an iron cog-rail; the abutments must be taken as they are; and, by using a long lever and light power in emergencies, those abutments may be made, in all useful cases, sufficient." Now, Sir, I defy Saxula to prove, that altering the length of the crank, or lever, will make any alteration whatsoever in the abutment, or hold, which the wheel has on the ground. The balance of weights on the arms of a lever is neither a good, nor a true illustration of the force of long cranks on his locomotive fulcrums, as it bears no analogy at all to the action of mechanical power as applied for the purpose of locomotion; for whether acting on long or short levers, whether perfectly quiescent, or exerting its utmost power, there will not be the slightest difference of bearing on his fulcrum, that is, the ground.

2nd. His application of a lever of the second order to turn the carriage-wheel, as shown page 266, does not in any way change the order to which the said wheel, considered as a lever, properly belongs.

3rd. I cannot, for a moment, suppose that any one of your readers will differ from him in opinion, that the effect produced by a single, will be widely different from that produced by a double engine; but I am at a loss to know what difference the position of the cylinder can make in the production of rotary

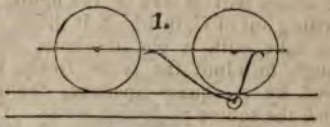
motion, which is all that can be expected, or even required of the engine; but I admit there is some difference between the action of wheels, and that of cranks.

4th. As I have said before, I do not believe his 5th proposition to be even partially correct, as a weight so applied, can in no locomotive case correctly represent the action of mechanical power. I agree with what he terms a leading principle, and for that very reason have I contended, that while the wheel is considered as the lever producing locomotion, and that locomotion can only be produced by the rotation of such wheel, there can be no other fulcrum to the lever, against which the power is exerted for that purpose, than the centre of such lever-wheel.

5th. Cog-rails can only be usefully employed in situations where the wheels are driven round without causing the carriage to advance, and then they would effect that, which no alteration of leverage, nor even an addition to the power, could do without them.

6th. Gearing of long radius (or what S. now admits to be the same thing, losing speed to gain power by intermediate machinery) will produce no practical advantage, nor surmount any obstacle that may fall in the way of locomotion, where the power is sufficient to give rotary motion to the wheel.

I am wholly at a loss to discover any analogy between the wheelbarrow problem and the cycloidal curve, described by a pin in the rim of a coach-wheel; neither can I see any practical advantage that locomotion is ever likely to derive from one or the other of them. It is well known that the carriage should advance a distance equal to the circumference of the wheel, for every revolution that it makes, and this being accomplished at the required speed, is all that can be desired; but here he entirely confutes himself, or, to use his own words, is at length caught in his own trap; for, if we draw a line perpendicular to the road, through the centre of the wheel, and cutting the rim in two places, fix a pin in it at bottom, and another at the top, though the latter may advance twelve times as fast as the former, he will still find that they both describe equal arcs in equal times, and although it may be matter of convenience, yet so far from there being any advantage in making the top of the wheel the point for applying the power, it will make no difference whatever if it acts at the bottom, yea, in that very point which he has chosen for the fulcrum. For instance, suppose the power as communicating motion to the wheel through the medium of a toothed pinion, one half the breadth of the sole of the wheel being plain to run on a rail * elevated a little above the road, the other part cogged to work with the pinion; now, I say, and it needs no demonstration to prove it, that whether this pinion be connected at the top, or at the bottom, as shown in fig. 1 (or, indeed, in any other part of the circumference) the power of locomotion will be precisely the same, and that without being in any way connected with the curve described by a pin fixed in the rim of the wheel, which, in fact, is merely a consequence of the combination of rotary with linear motion.



The diagram with which S. then favours us, is another convincing proof (to me, at least) of his having deceived himself; for he evidently considers the lever E and F as forming, together with the wheel G, a single lever of the second order, whose fulcrum is the ground, † whereas they are as distinct as it is possible for two things to be, the levers E and F being truly levers of the second order, the power acting at one end, the resistance being a tooth of the ratchet wheel, and situated between the power and the fulcrum, which is undoubtedly the centre of the wheel, it being equally immoveable as regards the action of the lever, whether the carriage is at rest or in motion. The same argument holds good with the other lever, or ground wheel, only that it is one of the first order, the power being applied to the

* The rail is introduced merely to clear the pinion.

† The fallacy of this position is easily demonstrated; call the diameter of the wheel five feet, the length of the lever E, to where the power is connected, also five feet; moving this point 12 inches will advance the carriage six inches; but if the ground were really the fulcrum, the carriage could then advance only four inches.

short end, or ratchet tooth,* its centre the fulcrum, and the resistance to be overcome is the rotation of the wheel, which, however, is retarded (in case locomotion be not produced) by the friction arising from the wheel's revolving in contact with the road, otherwise by the weight of the carriage only. The remainder of his paper requires no comment, as it consists (with the exception of a little bombast) of statements in which time and space are equally disregarded.

In continuation of the subject, p. 361, S. says, "experiments are certainly better than opinions;" but to render them so, they should be conducted impartially, and fairly appreciated, which I cannot consider to be the case, either from the description he gives of them, or from the comparison he has drawn between steam and horse power. His experiments only prove, that by having sufficient power, a carriage with plain wheels will ascend a very considerable acclivity; moreover, I make no doubt if he would but condescend to take into calculation the velocity, or the expenditure of power in his first mover, he would assuredly find his two experiments equivalent to each other, the power expended in the second, being five times as much as in the first, for each revolution of the carriage wheel.

In Saxula's comparison between steam and horse-flesh, he has again entirely omitted all considerations of velocity, and by so doing he has given credit to animal power for greater advantages than it in truth possesses. The facts are these:—

1st. That the power of the horse decreases in a certain ratio as his speed increases; thus the speed is regulated by the power that must be exerted; while the power of an engine is decreased, both by an increase and a decrease in the velocity of the piston—therefore an increase in the power of an engine, can only be obtained by intermediate machinery at the expense of speed. Now this is what he has all along been harping upon—although from first to last he has never even hinted at any plan that would be at all likely to succeed in practice; and the theory, apply it to what you will, is older than I can tell.

2nd. The only way to arrive at a just conclusion on the comparative merits of the two powers, would be to ascertain the greatest load with which, say four horses, could travel ten or twelve miles, and also the time of performing such stage; then, if the weight of the engine with all its appurtenances be equal to the weight of the load drawn by the horses, it would require an engine of eight horse-power to perform the same distance in the same time;* when, I have no doubt, that, taking all circumstances fairly into consideration, the advantages would be found in favour of mechanical power.

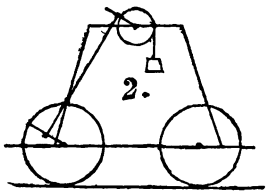
I will now turn to Saxula's query, p. 441, which amounts to this: Can a carriage run in opposite directions at the same time? For, he says, "can this machine be made to ascend the inclined plane G backward, without either turning about the carriage," or even reversing the motion of the propelling wheels? Here I confess myself too ordinary a mechanic, to discover what light Saxula may expect to obtain from such glaring absurdities. I therefore am of opinion with S. Y., that even should he gain more locomotive knowledge from this, than from the wheel-barrow problem, yet after all, it may be the smallest possible quantity; for, on referring to that far-famed problem, page 191, vol. 14, I find it contains an absurdity almost equal to the above—viz. "how can a man, without touching the ground, or having any lever or instrument in his hands, &c." Now who can doubt the incorrectness of this statement, when he has himself been ever since trying to prove that the man must (through the medium of hands) exert his power on a two-to-one lever of the second order?

In endeavouring by radii to show what the fulcrum is, he has again deceived himself by looking to the motion, which is compounded of both cause and effect; for although the radii A and B in their circular motion (as the cause)

* Here I beg to ask, what difference he apprehends would be produced on the centres, fulcrums, or abutments, if a sufficient power to produce the same effect, were immediately applied to a crank of equal length with the radius of the ratchet-wheel?

* This of course arises from this circumstance, that in estimating animal power, we only look to what the horse is capable of exerting over and above that which is required for his own locomotion, for if four horses draw a coach weighing two tons, at the rate of nine miles an hour, they also remove themselves, weighing little short of two tons more, the same distance in the same time. This most obvious fact has evidently been overlooked by Saxula.

run in contrary directions; they still, however, either in changing positions, or in completing a revolution, advance (as the effect) through an equal space. And if B is really the fulcrum, how is it that it can, as I have shown, be at the same time made the point for as effectually applying the power as any other radii in the wheel? Now, Sir, if we take AB to be the lever, B the place of the fulcrum, A that of the power, and the axle as the point of resistance, we have then a two-to-one lever of the second order.



If this is the true definition, the power A must be exerted over two radial spaces, while the axle advances a distance equal to one only; but we all know that facts prove the contrary—therefore, the ground is not the fulcrum of the radial lever AB; consequently, if he still insists upon it's being the fulcrum of locomotion, there must also be a lever of locomotion, to define which (it never having yet been done) I doubt will not prove so easy a matter.

Having thus freely, and I hope fairly, discussed Saxula's three last papers, I will as briefly as possible proceed to do the same by Hezron's. In the first place, I agree generally with the opinions expressed in his preamble; but in his elucidation, I am at a loss to know how a lever can change the place of its fulcrum while the power continues to act in the same way, viz. by causing the rotation of the wheel. But to case 1, fig. 1—all the weights acting freely over fixed pulleys, is a clear demonstration that one plus one is equal to two; fix F and it represents Saxula's two-to-one lever of the second order; for, increase P so as to overcome friction, and it will descend double the space through which R ascends. Remove the additional weight from P to R, and the lever is converted into one of the third order, but working on the same fulcrum; the power R being double the weight *of, and descending only half the space through* which the resistance P ascends. He then reminds me of having read, that a dead duck is no duck at all, for, he says, a lever held in equilibrio is no longer a lever!

In his introduction to Case 2, he says, "here an enlarged view of things opens itself to a contemplative mind," but in describing his locomotive diagram, fig. 2, instead of taking an enlarged view of the case, he merely gives P and R as before, and then says, *if* you keep the machine from moving, the third weight F may also be as before, when the whole will remain in equilibrio; he then goes off in search of the resultant of two equal forces acting at right angles, which he finds to be the diagonal of a square; but then it has just as much to do with the subject-matter, as if he had searched for and found the cause of failure in the Thames Tunnel. His discoveries, however, do not end here, for he found out that action and re-action take place between the power P and the fulcrum F of his lever CC (this, Mr. Editor, is something new, and, I fear, may make Saxula vain of his disciple) by which alone he appears capable of accounting for P's exerting a force equal to one only, whereas, in Case 1, it was equal to two; but I should account for it thus: making the pulley D part of the machine, reduces the velocity of P (by which alone it was equal to R) one half; the machine, being at liberty, must be put in motion by *r*—P's ascent and *r*'s descent being equal to each other; this diagram may therefore be said to represent horse, or as they say statumotive power, but cannot be made to illustrate any case in locomotion, either theoretical or practical; for, be it known to Hezron, that the resistance is a passive not an active power, as represented in all his three diagrams, except when on an inclined plane, but even there, like the motive power, it is carried by the machine. I trust I have now said enough to convince him, that it is not by such sledge-like contrivances as are represented in his first and second figures, that he can ever hope to forward even the theory of locomotion; and although his fig. 3 is not of the same description, it is still open to all the objections that I have before made to the direct application of weight as the representative of mechanical power, which, if it can be done at all, must be with some such arrange-

ment as shown in fig. 2, and then would, I think, possess many advantages. The weight suspended by a line, wound on a barrel, which is supported from the carriage, would itself form at once a portion of the load or resistance, as well as the impelling power, and may be connected with the carriage-wheels by cranks and rods, or other gearing. A model thus constructed, I have no doubt would tell us something about long and short cranks, but unless velocity is taken into account, it is a folly to talk of the effect produced by either one or the other.

I am, Sir,
Yours, respectfully,
TREBOR VALENTINE.

Derby, June 5, 1832.

P.S. I have just opened my letter to notice Saxula's one more proof; but which is just no proof at all—fix the pulley C to the side of the cart chest, when the 50 lbs. weight will no longer balance the 100 lbs, although it still acts with the same force and at the same point of the lever.

T. V.

Sir,—Since writing the hasty postscript to my last, I have more leisurely examined Saxula's home-proof, and trusting he is sincere, I heartily join in the hope that it will serve to convince *all* objectors, and finally settle this long disputed point. His query of "how in mechanics can 50 lbs. counteract 100 lbs., &c." will be best answered by considering the machine as he has shown it at the head of his paper, page 136. We will suppose the weight of the cart and load to cause a resistance at D just equal to 50 lbs. when the whole will be similar to a scale-beam with 50 lbs. suspended at each end, and of course requiring 100 lbs. to support its centre, or fulcrum; an addition now made to the 100 lbs. weight will destroy the equilibrium by giving motion to the machine, but can produce no action whatever in the lever AD; take the additional weight from the 100 lbs., and add it to the 50 lbs. when the motion of the machine will be produced by the action of the lever; again, after restoring equilibrium, lessen the resistance by lightening the load; both *weights will then* descend, the 100 lbs. *causing motion to the* machine, and the *50 lbs. producing it in* the lever, both at the same moment and entirely independent of each other, but of course in opposite directions—the fulcrum of the lever A B in every case being invariably the same.

I am, Sir,
Yours, respectfully,
TREBOR VALENTINE.

Derby, June 19, 1832.

THE DIAK SWORDS.

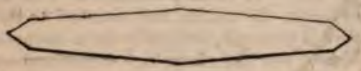
Sir,—In No. 460, there is an extract from an East Indian paper, entitled "Diak swords," which would seem all very wonderful and mysterious; but there really is nothing remarkable in it, except the pugnacious disposition peculiar to all savages, as we see evidenced in the fact of men living in a state of nature, without habitations, yet making as excellent weapons for human slaughter as the most civilized barbarians of Europe. That they make better swords, I deny; and I would wager the Tower armoury, and the banner of the invincible Armada to boot, that the Mr. Dalton, who makes the report, is something like Dr. Lardner's historian of the "Manufacture of Iron and Steel," no mechanic in his own person, but simply a taker of wonderful stories for gospel—possibly a "belligerent" European of Eastern India. As I am somewhat addicted to the destruction of superstitious stories, savouring of enchanted weapons, I shall proceed to make a few remarks upon the matter.

It appears that the iron is "found along the coast" of Borneo. I wish Mr. Dalton had stated whether native or in ore. If the former, it is probably of the same nature as the iron of Peru, and of excellent quality, containing a small portion of nickel. By the bye, it would be a very desirable thing for English mechanics to try their skill on that lump of Santiago iron, weighing some three hundred weight, which is in the British Museum. The chemists have done all they can to it, and why not let artizans try? There is more than enough for specimens; and if more be required, there is a mass of many tons' weight still lying in the identical desert, where it was discovered during the last century. Keeping things as mere "curositics," when they can be applied to useful purposes, is absurd. But to return. It seems that

the smiths of Bangermassing can use their iron to convert into steel for every purpose but cock-spurs, for which they use razor-blades. That is to say, for cutting or piercing implements they prefer cast-steel, their own steel being only fitted for chopping work, like shear-steel. Thus, in England, surgeons' instruments are made of cast-steel and sword-blades of shear-steel, like springs. "But the best iron of Bangermassing is not equal to that worked by the rudest Diak," and that again will not compare to what is "obtained farther north." "The farther a person advances into the country, the better will be found all instruments of iron." This beats the Runic smith hollow. The first sword severed a floating hair; the second, a whole ball of wool; the third, a whole woolpack; and the fourth, split an armoured-man down the middle so cleverly, that the two halves remained joined till he shook himself! Every thing is made to rise in value in proportion to the difficulty of getting at it, and this probably is the reason why the "wisdom of our ancestors" is in such great request, not being to be had; and the "maid-servants are so shocking bad now-a-days," unlike the maid-servants of the olden time, because we have them in abundance at our beck. The steel of the Diaks is probably of that class which is imported into England under the name of wootz, for the use of die-sinkers, because it bears a tough-cutting edge, which does not break away. But I believe there is much fancy in this, and that the best English shear-steel when carefully made, without regard to cost, is equal to the best in the world. The writer goes on to say, that the blades or mandows made by the wild men, and for which they are hunted by the Diaks, "will cut through even wrought-iron and common steel with ease." All very probable, but so would a shear-steel blade made in the same fashion. Swords, in India, are commonly made of two qualities, and many shapes; some to cut quilted armour, turbans, &c., and others to cut metallic armour, and scull-caps. For cutting a turban, a chopping-blow is useless; it must be a drawing-cut, and to this the crescent form is the best adapted, with the Damascus manufacture of iron and steel welded together in wires, so that upon *grinding, the alternations of hard and soft metal form* a serrated edge, well fitted for dividing woven garments The conqueror Timour carried the Damascus sword-cutlers to Persia in the 14th century, and from thence they probably extended to India. I have seen some of the long, straight, broad, two-edged, disk-hilted, Indian swords, formed of this same metal, but, upon examination, I generally found that a slip of wootz was welded into either edge, and the hilt was usually continued a foot or so down the blade, and rivetted to it, to give it strength, evidently for a chopping-blow. But the chopping-swords and war-axes of the Eastern Indians are generally made of wootz steel. But Mr. Dalton says, that with instruments made of the steel of the wild men whom the Diaks hunt, he has "had several penknives shaved to pieces by way of experiment." Now, really this seems marvellous. To bear an edge capable of cutting a quill, a knife must be considerably above spring temper, and therefore brittle. Such a material is evidently past "shaving" or filing. But if the blades were soft, they might be "shaved" like any other soft metal; in such case, they would be penknives only in form. Perhaps they were exportation ones, and thought good enough for India; or perhaps the handles only were shaved to pieces. The description is not very particular, neither is the form of the shaving-instrument specified, but I suppose it was a mandow, or sword, as it belonged to a worthy weapon-fancier named Seljie. But, that a properly tempered penknife could be "shaved to pieces" by any instrument that ever left an earthly forge, I utterly deny. As Mr. Dalton says that he saw it, we must suppose that he believed it, but he must excuse me from believing it, who have not seen it. Yet not satisfied with this wonder, he relates what he considers to be a greater wonder still, and thereby shows that his testimony in mechanical matters is worth just nothing at all. After the "shaving" of the penknives, Seljie laid an old musket-barrel upon a block of wood, and chopped it to pieces without turning the edge of his mandow. More than this, Mr. Dalton saw, "in the Sultan of Coti's house, three muskets more than half cut through in several places," on recounting which Seljie laughed, and said, "that his mandows would have cut quite through them at every stroke." I dare say, Seljie was a sly, good-humour-

ed Indian jester, who laughed in his sleeve at the credulity of his wondering Sahib guest.

That a heavy sword of Wootz steel, well-tempered, would chop an iron musket-barrel to pieces, is surely nothing miraculous, when the construction of it is taken into consideration. The section of a blade of the most approved shape is as follows:—

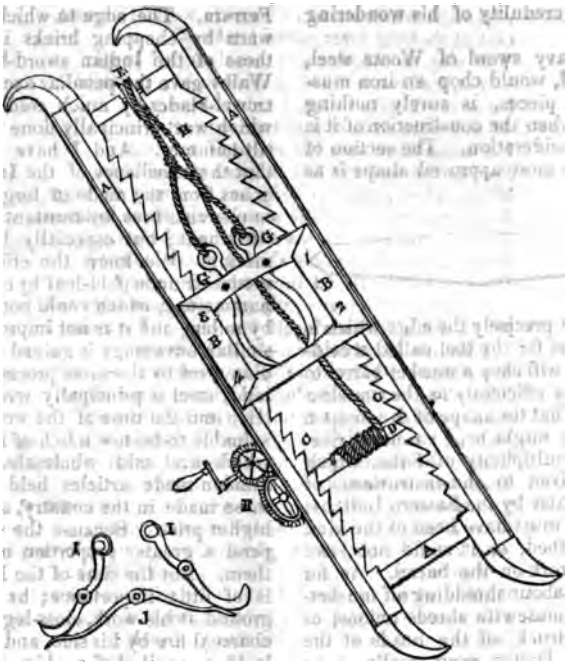


Now this is precisely the edge which is used by smiths for the tool called a cold-chisel, which will chop a musket-barrel to pieces quite as efficiently as the mandow of Seljie. What the shape of the weapon of that worthy might be, I cannot divine, amidst the multiplicity of forms which have been given to the instruments of human slaughter by the Eastern Indians; but the edge must have been of the kind I have described, or it could not have stood to its work on the barrel. As for Seljie's joke, about shredding off musket-barrels as a housewife shreds onions, or as Tarquin struck off the heads of the poppies, Mr. Dalton must really have been a very literal man to believe it. The muskets from the shop of the toyman, done in tinned-plate, might be served so; or even some of our modern sporting barrels, more remarkable for their lightness than their security: but a regulation musket-barrel would defy the force of any human arm to sever it, while held in human hands. Walter Scott makes Richard, the eater of Saracens' heads, chop an iron mace in two, when laid on a block, with a heavy two-handed sword; and Saladin severs a floating veil with his scimitar. And this is within the bounds of probability, if the mace was thin, and of soft iron, and the scimitar was of Damascus, with a serrated edge; but as for shredding musket-barrels at a stroke, it is "fudge." Had Mr. Dalton sought knowledge in the varied scenes of life, he would have known that there is an article called a "Walby's trowel," which bricklayers are very proud of possessing, and when they sometimes get merry in public-houses, they will amuse themselves by chopping the landlord's poker and fender with it, boasting all the while, and not without reason, of its superior temper, just as a Highlander would of his Andria Ferrara. The edge to which trowels are worn by chopping bricks is similar to those of the Indian sword-blades. Mr. Walby gave the peculiar excellence to his trowel-blades by much cold-hammering, which was principally done with a small tilt-hammer. And I have little doubt, that the excellence of the Indian swords arises from the mode of forging the steel in charcoal fires, by constant labour, and little heat; but especially by cold-hammering. We know the effect which is produced upon gold-leaf by constant cold-hammering, which could not be produced by rollers, and it is not improbable that a similar advantage is gained with the Indian steel by the same process. In England, steel is principally wrought by rollers, and the time of the workman is too valuable to bestow much of it on articles which are sold wholesale. Why are London-made articles held superior to those made in the country, and sold at a higher price? Because the workmen expend a greater proportion of time upon them. But the time of the Indian smith is of little importance; he sits on the ground at his work, cross-legged, with his charcoal fire by his side, and a miserable-looking anvil before him, wielding a strange-shaped hammer, and whether the sword-blade be three weeks or six in making, is a matter of no calculation to him. The iron which he makes his steel from is doubtless of excellent quality, and the abundance of cold-hammering does the rest. It is much to be regretted, that Mr. Dalton, instead of gathering up Indian fairy tales, did not visit a workshop, and describe in plain terms all that was to be seen therein, and how and where the metal was originally procured. It is really not creditable, that such ordinary matters should to this day remain a mystery to the public. Even Dr. Lardner, in his "History of Iron and Steel," has taken some pains to propagate absurd stories of wonderful swords, and thus christens absolute falsehoods "Useful Knowledge." It is time that all such matters should be left to the romance-writers, and plain philosophic truth told, in books which profess to convey information; or people will gradually begin to doubt whether there be such a thing as a fact extant.

I remain, Sir, yours truly,

JUNIUS REDIVIVUS.

IMPROVED CELLAR-STEPS.



Sir,—The prefixed is a rough sketch of a machine, which was invented by me a few years ago, for the purpose of raising casks out of cellars. A model of it was sent to the Mechanics' Institution of this city, and purchased by it—at a price, however, which rewarded me very inadequately for the trouble the invention had cost me. The advantage of this machine over those in common use is, that provided a rope should break or slip by accident, no injury can be sustained, either to the goods or to the person employed, which is now too often the case.

AAA is a strong wooden frame, of such size and length as may suit the work or place it is intended for. The inside of the frame is rabbited, and covered with an iron-plate CC, which plate is notched, and acts as ratches on each side the machine. On these slide at liberty another wooden-frame or carriage BB, and at the corners, marked 1, 2, 3, 4, there are four friction-rollers, to give freedom to its working on the plates. GG are two palls, fixed on the carriage BB, shown at H. The spring J makes the palls keep to the work and act upon the ratchets CC. H is a rope, which is attached to the tails of the palls, and passes over the pulley E, and is continued to, and fastened on, the the roller D, which being put in motion by the winch and wheels F, will, with equal ease and safety, either raise the carriage, or let it down. Should a rope break, the palls will immediately act and stop the carriage.

I am, Sir, your obedient servant,

R. Gooch.

Lakenham, near Norwich,
March 1, 1832.

MECHANICAL ENIGMA.

Formed like old Adam, from the dust of earth,
Science, benignant fairy! gave me birth;
She taught my nature in its earliest hour
A thousand forms to take, from human power;

So pliant *then* I bend 'neath every blast;
Although when once in this wide world I'm cast,
Old age's hard prerogative I take—
You may no longer bend me, though I break.
Yet, call me not a thankless child; the debt
I owe my kindly nurse, I ne'er forget.
If any dare so base a charge support,
I'll make them own the worth of a retort.
For 'tis through me fair Science oft delights,
With widest range, to wing her heavenly flights;
And, strange to tell, she soon would cease to know,
Without my aid, the least of things below.
When to old Franklin's skilful hand I came,
Who will deny that I increased his fame?
The means withdrawn, my grateful care supplied,
Might not a Newton's self less known have died?
Take me in other form—I still bestow
My changing gifts on busy man below;
E'en o'er the Church, behold, through me alone,
In ages dark a light from Heaven is thrown;
But, ah! to what vile ends the brightest reach!
Tinged by the temper of the times, I teach
Dark superstition, at her evening prayer,
To trace out ghastly shapes, and, awe-struck, swear
How bloody shades of blessed martyrs smile,
And knights, long dead, gleam through the gloomy aisle.
Again I change, and still some good impart:
Dames with blue devils! Hotspurs without hearts!
Come one and all! e'en Falstaffs fond of sack!
In me you'll find the spirit that you lack;
And if that fail, and you by chance despair,
I pour a poison, that will end your care.
But, presto Proteus—grant one other shape,
Once more I strive detection to escape:
Thus, then—I please, when courted by the fair,
Age and deformity I never spare;
'Tis rare we meet—but if, perchance, we do,
Unlike the meanness of a treach'rous foe,
I ne'er, when face to face, the truth suppress,
But tell of faults their folly ne'er would guess.
Nor does my steady virtue ever make
Unkind reflections when behind their back.
'Tis true that gossips say, I cut my friends;
This my sole crime—and here my riddle ends.

H. H.

MACHINES FOR FELLING TREES.

Sir,—I feel much gratified by the attention you have bestowed on my communication on the subject of felling trees: that machines for such purpose had been previously constructed was unknown to me, and most probably to many readers of your useful Register; a subject, however, so important at this time, *I trust, will not be dropped before much additional and valuable information will be drawn together.* Mr. Jack's machine (described at page 194) is no doubt well adapted for the end intended, which I take to be the saving of waste which would otherwise be caused by the axe. Allow me to enquire of your scientific correspondents, whether a machine upon the same principle could be constructed capable of working a saw of four feet diameter? Provided that can be accomplished without rendering the whole too cumbersome, it would doubtless be a valuable instrument in the forests of Ame-

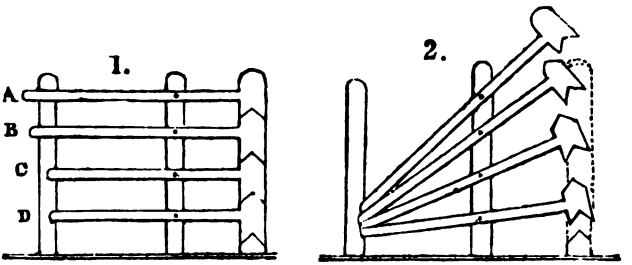
rica, where I expect timber trees of four feet diameter are of more frequent occurrence than of one foot; in which case, three operations with a four feet saw would effect the purpose in less time and labour than the axe; but for the latter, I should judge the axe would be preferable. Mr. Jack's machine, I observe, cuts close to the roots; but, if thought desirable, there could be no difficulty in raising it two or three feet.

The suggestion contained in No. 463, respecting the employment of Bramah's pump for extracting the stumps of trees, and the method adopted in New South Wales of burning them, will, no doubt, both be acceptable to the American settler; as the pump might be available in the wet season, and the latter mode during the dry season.

I am, Sir, repectfully,
Your obedient servant,
J. HOUNDS.

July 1, 1832.

IRISH FIELD-GATE.



Sir,—When lately in Ireland, I saw, near the delightful village of Bray, a small field-gate, which for utility, simplicity, and elegance, I have never seen equalled. I send you a rough sketch, which will perhaps be acceptable to the readers of the Mechanics' Magazine.

Fig. 1 represents the gate shut, and fig. 2 shows it open. It will at once be seen, that as the bars ride upon centres fixed into the middle-post, when a person wishes to pass the gate, he has only to press down the ends of the levers, ABCD (see fig. 2), and he will pass through it without difficulty; and when on the other side, he has only to withdraw his hand, and the bars will immediately regain their horizontal position. The dotted line, fig. 2, represents a fixed post behind the levers, I suppose intended to steady them.

I am, Sir, yours respectfully,
E. J. MITCHELL.

Bradford, Yorkshire, June 19, 1832.

BUSBY'S PATENT HEATING APPARATUS.

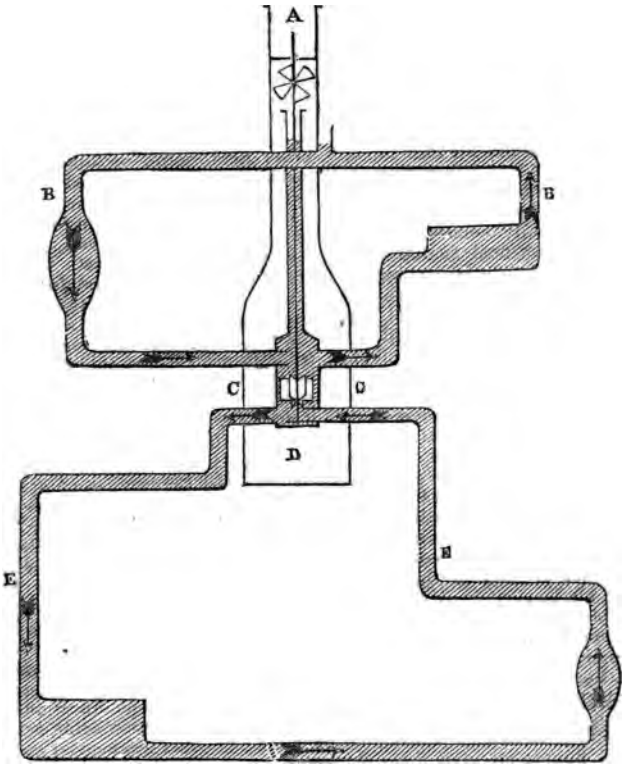
Sir,—It is no doubt well known to a great proportion of your subscribers that the use of hot water, circulating through appropriate tubes or other receptacles, has, from its very agreeable and innoxious effect, become much in request as a medium for warming the interior of buildings, conservatories, hot-houses, &c. &c. from a distant fire; but it is also known, from the peculiar manner in which *the circulation is produced*, that *the operation of every such* apparatus is at present in some degree a matter of experiment, and therefore uncertain, that in some cases it is quite inefficient, and that in no instance has hot water been made to circulate and communicate heat in an apartment situated *below* the level of the fire employed in connection with it.

These circumstances, inasmuch as they limit the application, have as yet presented serious obstacles to the general introduction of a most appropriate medium for communicating warmth; I therefore

wish to inform your numerous readers that I have invented a method of completely obviating every impediment, for which I have recently obtained a patent; and to enable them to judge of its efficacy, I take the earliest opportunity of sending you a copy of my specification, accompanied by an explanatory diagram, which, I trust, will find a place in your valuable work.

I am, Sir,
Your obedient servant,
C. A. BUSBY.

Stanhope-place, Brunswick-terrace, Brighton.
July 2, 1832.



SPECIFICATION.

My "improved method of producing the circulation of fluids," whether hot or cold, through pipes, cisterns, or other vessels, consists in applying external mechanical force generated by a current of smoke or air acting in an apparatus similar to a smoke-jack, without reference to the direction or position of such pipes or vessels in which the fluid is contained, whether upward, horizontal, downward, or oblique, in which the said *pipes, cisterns, or other* vessels, may be *extended or placed* with respect to the level of that part of the apparatus, at and by which the said circulation is caused or created, and the contrivance which I have invented and applied to employ the said mechanical force to cause or create the said circulation, consists as follows:—

I provide a cistern or boiler (for which a cylindrical shape is best) and pierce two holes in the circumference near the bottom, and fix a pipe, water-tight, through one of the said holes, so as to enter and project within the said cistern or boiler, and so that the open end so projecting within shall just reach to, or near to, the centre of the cistern or boiler near the

bottom. I extend the said pipe externally from the said cistern or boiler in any direction through any building, vault, ship, or carriage, and to any length upward, horizontally, downward, or obliquely, that may be required; and then I bend the said pipe and extend it back again, in any required direction, upward, horizontally, downward, or obliquely, so as that its other open extremity shall just reach to the other opening in the said cistern or boiler; into which opening I fix (water-tight) the said other extremity, so as that it shall not project at all, or as little as possible, within the said cistern or boiler, and I then fix a circulator, constructed and fixed like the wheel of a winnowing machine, on a perpendicular axis within the cistern or boiler, with its centre or axis as nearly as possible over that end of the pipe which reaches to, or near to, the centre of the cistern or boiler, and I make the axis of the said circulator to rise above the cistern or boiler, and to be mechanically connected with, or terminated by, a wheel similar to a smoke-jack-wheel, so as to fit it to have a rotary motion imparted to it through the agency of the said smoke-jack-wheel, by the mechanical force of a current of smoke or air as may be most convenient. If the said pipe before described be made to rise above the cistern or boiler, the top of the boiler should be closed water-tight, and the axis of the circulator be made to pass through a stuffing-box in the top, to prevent the escape of fluid. If now the cistern or boiler and the pipe be filled with fluid, which filling may be performed through an opening to be made for that purpose in the upper part of the system, consisting of the said pipe, cistern, or boiler, above mentioned, and the circulator be made to revolve by the application of the mechanical force of a current of smoke or air as aforesaid, it will impress upon the fluid within the cistern or boiler a rotary motion, the centrifugal force of which revolving fluid will so act against the fluid in the pipe aforesaid, as to cause the fluid to circulate through the said pipe, so as to run out of the cistern or boiler into the pipe at that end of the pipe which reaches only to the circumference of the said cistern or boiler, and to run into the cistern or boiler from the said pipe at that end of the said pipe which projects within the said cistern or boiler to the centre, or nearly so, of the said cistern or boiler.

If hot fluid be thus made to circulate through a pipe extended as aforesaid (which pipe may, if required, be enlarged at any part or parts into a cistern, or cisterns, or vessels, having any other name) it may be used to impart heat to the interior of any building, vault, ship, or carriage. Or, if cold fluid be thus made to circulate, it may be used to abstract heat from the interior of any building, vault, ship, or carriage; and if the whole, or any part of the said pipe, or any of its enlargements, into cisterns or other vessels, as aforesaid) be made to pass through any other fluid, or through any solid or other body, the fluid contained within the said pipe and its enlargements (if any) as aforesaid, may, if required, be made to communicate heat to, or to abstract heat from the said other fluid, solid, or other body, or to be itself cooled or heated as may be required according as the temperature of the circulating fluid may be arranged to be above or below the temperature of the said other fluid, solid, or other body. The mechanical force required to produce a velocity of circulation sufficient for the purpose of communicating or abstracting heat, as above described, is so small, that a fire placed beneath or about the cistern or boiler, containing the circulator sufficient to heat the fluid therein contained, will produce a draft through the chimney or flue carrying off the smoke from the fire; if the said chimney or flue be of proper height and dimensions, sufficient to impart to the smoke-jack-wheel, if properly fixed in the said flue, and connected as aforesaid, or in any other convenient, mechanical, and workmanlike manner, with the circulator aforesaid, such a motive power as to cause the necessary rotation of the said circulator as aforesaid. And I declare such application of a smoke-jack wheel, in combination with the circulator as aforesaid, to be my invention, whether the said smoke jack wheel be moved by smoke or by a current of air produced in any way whatever. And I also declare as my invention the application of a common alternating or other pump, or any modification or multiple thereof, such pump being actuated by a crank, or other mechanical contrivance moved by a smoke-jack wheel, as aforesaid, and being to be used in lieu of, or as a substitute for, the said circulator, so as to cause the circulation of fluids through pipes, cisterns, or other vessels, for any of the above purposes; which application may be effected by fixing and extending the said pipes, cisterns, or other vessels, so as to constitute, in effect, one united, continuous, and simultaneous discharging and supplying pipe to such pump, or any modification or multiple thereof; although I consider such application of a common alternating, or any other pump, or any modification or multiple thereof, in com-

bination with a smoke-jack wheel, to be in most cases very inferior in point of utility and convenience to the use of a circulator as above described. To avoid the use of a stuffing-box, which will often be found inconvenient where the pipe of circulation, or its enlargement, is carried above the cistern or boiler, a pipe of appropriate diameter, fixed water-tight in the top of the boiler, may be carried up from a hole to be made for that purpose in the top of the said cistern or boiler, to a height somewhat exceeding the extreme height of the said pipe of circulation and its enlargements, if any; and the axis of the circulator may be prolonged from the cistern or boiler, through and above the said pipe so carried up, and the communication of mechanical force to the said axis be made above the said pipe in manner aforesaid; the axis of the circulator and smoke-jack wheel is to be retained in its proper position in any convenient manner familiar to working-mechanics. And in all applications of the apparatus above described, and in any of its modifications, provision must be made for the escape of air or other elastic fluid which might otherwise lodge within any part of it, and also to allow for the expansion and contraction of the apparatus itself, and of the fluid contained in it, arising from any variation of temperature, by the same means as are now commonly practised in other apparatus used for similar or analogous purposes. And I also declare, that in all cases the actual and relative magnitudes and forms of the cistern or boiler, and fire-place or furnace, and of the circulator and smoke-jack wheel, and of the mode of connecting the circulator and smoke-jack wheel, and the diameter, shape, length, and direction of the pipe of circulation, the dimensions of the enlargements therein, as aforesaid, the height of the chimney or flue to carry off the smoke from the fire-place or furnace, and the selection of the materials of which the whole or any part of the entire apparatus, or any of its appendages, is to be constructed, must depend upon the circumstances of the case under which this invention is required to be applied; and which magnitudes and forms, modes of connecting, diameter, shape, length, direction, dimensions, height, and selection of materials, must therefore be determined by the judgment of the person making use of it. Having now described the nature of my invention, and the manner in which the same is to be performed, I would have it understood that I lay no claim to the various parts herein described which separately are well known and in use; neither do I claim the circulation of fluids for the purpose of conveying heat for heating buildings and other purposes, or for abstracting heat therefrom: but what I claim as my invention is the combining the smoke-jack (actuated as aforesaid) as a motive power, with a wheel, or circulator, or pump, for the purpose of producing a circulation of fluids for carrying heat to buildings, and other purposes, or abstracting heat therefrom, as above described.

In witness, &c. C. A. B.

Description of Engraving.

A is a flue, with a smoke-jack wheel.
BB the ascending pipe of circulation.
CC the boiler and circulator.
D the fire.
EE descending pipe of circulation, with enlargements.

Two pipes of circulation are exhibited in the figure, for the purpose of showing the application both in ascending and descending tubes. The arrows in each pipe show the direction of the circulating fluid.

NOTES WORTH NOTICE.

"NOTA BENE—NOTE WELL—as it is the shortest, is also perhaps the most valuable of maxims: the whole pile of Human Science is built on the groundwork of OBSERVATION."

The Pitcairn Islanders.—News has reached England, that these unhappy people have been rescued from the miserable condition into which they had sunk on the island of Otaheite, and carried back to their deserted home. The measure of transporting them to such a place as Otaheite had been deprecated by every person at all acquainted with the subject, but it is doubtful whether it were the best course to pursue to restore them to their native island. It is to be hoped, that if they are destined to another removal, a little more judgment will be displayed in the conduct of it. Out of the number—87—conveyed to Otaheite, no less than 12 died during their short but disastrous residence there; and it is too much to be feared that the purity and simplicity of character of the rest has been totally destroyed.

Signs of the Return of Letters to the East.—The literary proceedings of the inhabitants of our vast Indian empire continue to be extremely interesting. The rage for newspapers appears to be rather on the decline at Calcutta, no less than three of native editorship having lately been discontinued; the taste, however, for journalism has spread to Bombay, a

presidency which, till lately, could only boast of one native paper, *The Samachar*, published weekly in the Guzerattee language; a competitor, however, appeared to break the monopoly on the 6th of January, entitled *The Bombay Durpun*, and published only twice a month, half in Mahratta and half in English; and since its establishment, *The Samachar* has assumed the form of a daily paper. Another symptom of the spread of intelligence in the East is the actual establishment of a lithographic press in the Persian city of Shiraz —celebrated in "the olden time" for the excellence of its poets—at which part of "The Koran" has been already printed.

Scientific Obituary.—The scientific, in common with the literary world, will have abundance of reason to mark the year 1832 as one of mourning. The rolls of foreign science have sustained losses of the first importance, while at home we have to lament the recent deaths of Sir James Hall, the President of the Edinburgh Royal Society, and father of the enterprising navigator, Captain Basil Hall; Mr. Dodwell (whose "Classical Travels in Greece" gained him considerable reputation on its appearance some years ago), who died in Italy, where he had resided during most of the latter part of his life; and Mr. Alexander Nimmo, the eminent civil-engineer of Dublin, well known for his extensive scientific labours in the improvement of the bogs of Ireland, and his elaborate survey of the sea-coasts of the sister-island, as well as in his capacity of engineer to the Leigh and Wigan Railway, and many other undertakings of the same class, and as the writer of several valuable papers in various Encyclopædias. Mr. N., although settled in Ireland, was a native of North Britain.

Italian Agriculture.—The Tuscan system of farming has often received the warmest praise from the passing traveller; its defects are only apparent to the cultivators themselves. One of the greatest landed proprietors in the Grand Duchy, the Marquis Cosmo Ridolfi, stimulated probably by the praiseworthy example of the Bedfords and the Cokes of England, has determined to endeavour to introduce a better state of things, and, with this intention, proposes to give up a valuable portion of his estate for the establishment of a model and experimental farm, and to place it under the superintendence of the Agricultural Society (Giorgiofili) of Florence, who have expressed their willingness to undertake the charge, and their admiration of the munificent and patriotic conduct of the Marquis; he, on his part, hopes that his example will meet with a sufficient number of followers in the owners of estates in other parts of Italy, to give an universal impulse to the agricultural improvement of his native land.

The Gresham Lectures.—These lectures, there is some reason to believe, still continue to be delivered, or, rather, the Professors still profess to be ready to deliver them whenever three persons present themselves at the proper moment in the obscure hole, somewhere about the Royal Exchange, appropriated to the purpose. Nay, from a passage in the venerable *Gentleman's* for the month, it would appear that on some day in May or June, a ten-guinea medal was presented to a suburban organist for proficiency in music, after a *public* (?) contest for the prize, and that afterwards Professor Stevens actually gave a lecture on the science, with *vocal and instrumental illustrations*. This looks well; but from a passage towards the end of the article, we are tempted to suspect that the exhibition was known beforehand only to the happy few who attended, and that its *publicity* was kept as *private* as possible. The truth, we believe, is, that the regular courses of lectures, which Sir Thomas Gresham ordered to be read every day in Term, are never delivered unless three persons at least are ready at the door of the aforementioned obscure room over the Exchange, at the precise minute named in the advertisements; so that as the fact of their delivery is only known as a matter of tradition to the majority of the citizens, the consequence is that the gentlemen Professors are rarely troubled at all! Endeavours have often been made by the Common Council to reform this ridiculous system, but hitherto they have been uniformly foiled by the dogged obstinacy of the Professors, who having been *jobbed* into their posts as comfortable sinecures, are quite determined to do nothing for their salaries. It is understood, however, that some members of the Common Council intend soon to revive the subject, and to propose that the lecture-room for the future be one of the now-unused courts in Guildhall; that either the Professors or their lectures be modernized and improved; and that the time of delivery be altered to the evening, instead of noon, as at present. It is to be ardently hoped that they may be able to carry their intentions into effect, and that the noble bequest of the princely merchant, so consonant to the spirit of the present age, for gratuitous public lectures—open to all—on the most important sciences, will not remain any longer a mere dead letter.

F. H.

THE BIRMINGHAM AND LONDON STEAM-CARRIAGE COMPANY.

Sir,—Allow me, through the medium of your useful Journal, to ask the projectors of the "Birmingham Steam Carriage Company" (see Mech. Mag. for June 23, 1832, p. 392) if they have ever made any trial of their machine, either on a turnpike or other road? I am an inhabitant of Birmingham, and have heard a great deal said of the merits of Dr. Church and his new invented carriage, and what it is capable of doing, but I cannot find on what road any experiment has ever been made to satisfy the public that it is capable, as alleged, of "taking a weight of fifteen tons fifteen miles an hour," and of "ascending any hills upon the turnpike-roads." We well know, that many steam-carriages have been made in different parts of the country, and tried at individual expense or nearly so; and that the proprietors have found difficulty in mounting hills at a slower speed than *ten miles* per hour, and with less weight than five tons of goods attached. I quite agree with your correspondent, Saxula, that it is no easy thing to generate steam as fast as two 8 inch cylinder-engines will use it, and maintain, at the same time, a pressure of 30lbs. per inch. How, then, is Dr. Church to generate steam for four 9-inch cylinders, and maintain a pressure of at least 100lbs. per inch? Even then he could only make his engine do one half the work set forth in this prospectus, and keep the machine within such compass as to let other carriages pass it on a common road.

As there seems at present some doubts about the practicability of employing steam for quick conveyances on common roads, I think the public should not be entrapped into a delusive scheme before the machine in question has had one public and decisive trial.

Hoping the Birmingham and London Steam Carriage Company will give the public ocular demonstration that their prospectus is not delusion,

I am, Sir, your humble servant,

J. H. B.

Birmingham, June 30, 1832.

English and American Settlers.—"A word or two to Junius Redivivus. At p. 199, he attempts to set up the Yankees as patterns of enterprize and spirit; their title to these qualities I do not dispute; but the instance he advances will not serve for proof; viz., a Yankee agrees, for a valuable consideration, to transport some artillery from Lower to Upper Canada, using for that purpose the government cavalry horses; what risk, in case of failure, was he to sacrifice? And if none, where was the spirit of the enterprize? J. R. further states, that land in Canada is given away—is this correct?* The Yankee may be better calculated to succeed in a forest than a Briton; but let not the latter be first discouraged, and then led astray by vague statements. J. R. informs us that he made a *lucky* escape from Canada into the States; *where* he made his fortunate location he does not name; of course not in the district of Ohio, because, *he says*, Ohio is unhealthy; others have stated the contrary: I confess my dull comprehension can discover nothing useful or satisfactory in J. R.'s communication here referred to."—J. Hounds, July 1, 1832.

Platina Lamps.—Sir, With regard to Mr. Merryweather's Lamp, mentioned in No. 461, I should be glad to learn whether the small cage of wire without the spongy platina would not succeed as well as with it? Even a coil of platina wire heated to redness and suspended above a vessel of alcohol, or ether, will burn till the spirit is consumed.—I remain, &c. Chemicus.

Mr. Babbage's Calculating-Machine.—Sir, I have always understood that when an engineer has a great work to execute, he first forms his plans, or has them formed under his own inspection by some one of scientific attainments and experience, and whose undivided attention is given to the subject; and having well digested and arranged them, he gives directions to a number of different persons, who each executes the portion of the work entrusted to him according to the order of the contriver, who sees all the parts put together; thus facilitating the completion of the work by dividing the labour. Mr. Babbage, who has lately published a work on the economy of machinery, seems to understand these matters; but if he has adopted a similar mode of proceeding with his calculating-machine, how are we to account for the very great length of time it has been on the stocks? When it is considered that the people are to pay for this machine, I trust these observations will not be deemed impertinent.—Yours, &c., Publicola.

Chirodrome.—This name is given to a locomotive-carriage, invented by our townsman, Mr. Ruthven. There are two seats, supported by four wheels, three feet diameter; two of these are fixed on the axle, which has a pinion in the centre; this is made to revolve by two spur-wheels, that act as toothed-levers; the power and motion are communicated by pulling and pushing a vertical lever, having its fulcrum on the axle of one of the spur-wheels, and a pall jointed to it falling on the teeth. The action is the same as rowing an oar, with this difference, that the propelling power is both to and from. Besides the power being applied in this most favourable manner, it has the advantage of producing any given impetus from a very beautiful and simple arrangement for exchanging power and motion when required, without stopping the carriage to make the change. It can be propelled at upwards of ten miles an hour, and by the application of a very effective drag, the carriage can be made to stop when required. It appears to attain to a certain extent on land, what is attained in rowing a boat. The carriage has made several successful experiments in the London Road, and up the steep ascent at the head of the eastern road to Leith, communicating with the Calton Hill, a rise of about 1 foot in 15.—*Edinburgh Courant.*

INTERIM NOTICES.

Our friend, "S. P.," will have observed, that the description given of Mr. Hemming's Safety Blow-Pipe in the account of the Oxford Scientific Festival, makes the insertion of the communication with which, at our request, he obligingly favoured us, unnecessary. We feel, however, not the less obliged.

Communications received from Hannah—Observer—Mr. Bayley—E.—Saxula—Mr. Deakin—An Engineer—A Subscriber at Youghall—A Mechanic.

ERRATUM.

"In page 148, June 8, 1832, No 461 of your Magazine, in the 15th line from the top, for the word "pointed," read "dressed." The former word was not used; the latter makes sense of the paragraph, and duly shows my intention and meaning.—A Worker of Horses in London."

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* It is not. Formerly this was the case; but of late the government lands are all sold at a fixed price per acre.—Ed. M. M.

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Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 467.] SATURDAY, JULY 21, 1832. [Price 3*d*.

STEAM PONTOONS.

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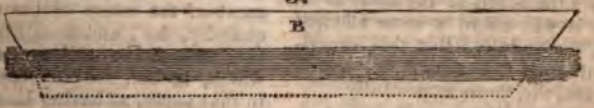

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STEAM PONTOONS.

Sir,—I beg to submit to the attention of your readers the following mode of constructing steam-vessels. Its simplicity and cheapness may induce its adoption, and I have little doubt that its speed would equal, if not exceed, that of the steam-vessels now in use. The plan, however, is not new. A steam-ferry, upon the same principle, now conveys cattle, carts, passengers, &c., from North to South Shields and back. The purpose to which it is applied renders speed and appearance of little moment, especially as the distance is scarcely a mile. By the proposed form of the pontoons, and arrangement, &c., upon deck, the desiderata of speed and elegance would be obtained, in addition to the essential advantage of cheapness.

Fig. 2, AA, are two pontoons, constructed either of wood or iron, long, and *sharp at the extremities*. Fig. 3 is a side-view of a pontoon in the water. The two pontoons are then connected together by a deck, CC, leaving a space, D, for the play of the paddle-wheel between them. Upon the deck are then built the engine-house, E, (fig. 4), and the fore and aft cabins, NZ. The engine-house might be built in an ornamental style, to disguise the defective appearance of its being upon the deck instead of below it, as in fig. 1.

As the deck strongly connects the pontoons, it might possibly be advantageous to construct the forms of the latter as in fig. 5, as it will afford a more efficient action of the paddle. But this, experiment would only determine.

I am, Sir, yours respectfully,

WILLIAM RANWELL.

N. B. The pontoons ought to be flat-bottomed.

MOTION OF FLUIDS.

Sir,—From the very contradictory nature of the papers of G. L. S., I must conclude that he can have given the motion of fluids little consideration, and has bestowed even much less in ascertaining the points on which we really differ. By experiments somewhat similar, pp. 108 and 213, vol. xvi., we arrive at the same conclusion, namely, that it is the weight, or height of water alone, and not the form *of the discharging-pipe*, that affects the *quantity discharged* in a given time. I *do not, however,* consider his apparatus at all adapted for inspecting, either the form or extent of the currents; nor is a piece of cork, from its extreme levity, by any means calculated to show them, particularly when combined with the smallness of his vessel, there never being more than two and a half inches of head. A cork, fixed by a thread to the bottom, would not indicate the feeble currents that would be formed under so trifling a pressure, though if allowed to float, it would certainly show with great accuracy any that might occur on the surface. Although G. L. S. thus confirms what I have before expressly stated, viz. that currents do not form at the top, and that the surface continues undisturbed until just before it reaches the top of the pipe; yet, directly after, we find him contradicting this statement, by saying, "from which it appears, the water approached the pipe in a column from the top of the fluid, equal in size to the hole it passed out by, and was, I imagine, supplied from the top in the same manner till it got down to the pipe." Had this been the case, it must certainly have been shown by the floating cork; this however was, in fact, the erroneous opinion I formed previous to experiment (see vol. xiv. p. 21.)

By way of proving the general correctness of his remarks, G. L. S. asserts, (p. 127) that he has several times repeated the experiments described, p. 108, vol. xvi., which were made solely with the view of disproving Venturi's statement of the cause of the difference in quantity, &c., and were never intended to illustrate the course of the currents, which, in fact, are only casually named in that paper, as having been sufficiently proved before. He then again repeats "that the currents do not reach the top," and in the next place re-asserts, that "buoyancy is the only similarity melted metals possess with water." Still, however, he thinks he may grant them fluidity, although he will not allow that they can in any way be called a fluid, or that they have any of the mechanical properties of fluids, excepting, as he before said, buoyancy. Now, as all this appears very like contradiction, you must permit me to go a step further, and to ask which of the general properties of a fluid, fluid metal does not possess in common with all other dense fluids, such as oil, water, quicksilver, &c.? It has the same slight cohesion of particles; it yields to pressure

with the same facility; it shows the effects of gravitation in the same perfect manner—having the same property of returning to a state of equilibrium; it has the same lateral pressure among its particles, by which the sides as well as the bottom of the containing vessel are pressed against; and, in fact, it is capable in the same manner of exerting pressure in every possible direction, &c. &c. &c.

He then asks, "How can the power of gravity account for the cold iron floating on the surface of melted iron, or even on melted lead, when T. V. acknowledges the solid to be specifically the heaviest?" Here he is once more wrong, for I never could acknowledge any such thing. It was from finding that cold iron did, in opposition to the power of gravity, float in melted iron, that I was first led to call the attention of your readers to the subject; and it is quite impossible to conceive how G. L. S. could so misconstrue my words, as I said, and I will not gainsay it, that the power of gravity alone is quite sufficient to account, not only for the sinking of a solid piece of lead in melted lead, but also for a piece of solid iron floating in melted lead. In the first instance the solid is heavier than the fluid, but in the second the fluid is about one and a half times as heavy as the solid.

G. L. S. next says, "he must further persist in thinking that the expansion of congelated water is owing to the air it contains, upon which also its buoyancy depends in some measure," and that he "certainly never heard of the buoyancy of frozen water." Now pray do, Mr. Editor, have the goodness to assist me in discriminating between congelated water and frozen water, as he speaks confidently of the buoyancy of the former, although he never heard of it in the latter! Well, he then goes on—"if the principle of affinity and presence of air were not combined in water to give buoyancy, vessels of every description would necessarily sink.*" Air combined with water must, of course, render it lighter. In the next sentence we find it stated, that muriate of soda in solution renders it heavier, but, according to his dictum, both increases its buoyancy; he does not attempt the proof, but he says, "it can be proved, that congelated water expands from the air it contains, (not because air itself expands with cold, but) "simply because it cannot freeze." I am perfectly aware that it will not become solid, but it will give out its caloric much more freely than any matter with which it may be combined; and this circumstance satisfies me that it will not receive, or, at any rate, that it cannot retain, the caloric which is given out by the denser fluid on its becoming solid. It is also my opinion, that although it will not itself become solid, it still remains as intimately mixed in ice, as in the water previous to its congelation; and where much air is combined with the water, it is that which causes the tinge of whiteness, which, in a great measure, destroys the transparency of large bodies of ice. G. L. S.'s concluding sentence furnishes another proof of the characteristic correctness of his remarks, by being far too general; as the converse is well known to be true—neither air nor agitation being necessary for the purity of water—pure water, properly secured from air, requiring no agitation to keep it pure.

I remain, Sir, yours respectfully,

TREBOR VALENTINE.

* According to this theory, neither the gravity of the fluid, nor that of the vessel, has any thing to do with *floatation, and, consequently*, a cork must sink *in a vessel of water placed under the exhausted receiver of an air-pump!*

ILLUMINATED DIALS.

Sir,—I trust you will allow me to make some observations on a communication by F. H., which lately appeared in your Magazine, (p. 105 of the present volume), respecting illuminated dials. Your correspondent seems to ground his principal objection upon their expense; and certainly from what is reported respecting those that have been erected in London, and in some parts of the country, there appears some foundation for it. Neither can I consider Mr. Paine's reply to have removed the objection, as he does not state what work was done for the £50. Taking into consideration that his figures and the frame-work of the dial are of cast-iron, he ought, I conceive, to be able to erect them for even less than the sum he has stated. Your correspondent, F. H., views the matter in a merely theoretical, instead of a practical, point of view; and particularly labours under the erroneous idea that the principal part of the expense attaches to the dial-plate, &c., whereas there are many items for scaf-

folding, mason's work, and other extras. For instance, in one place where I was employed, the charge for scaffolding was £2, and for the mason's and carpenter's work, £4; in another case, £3 were required for scaffolding, and £6. 15*s.* for mason's work; while in another place where I was consulted, these two items amounted to £26, owing principally to the peculiar situation of the church.

Respecting the plan proposed by F. H. there appears to me to be several insuperable objections besides those adduced by Mr. Paine. In the first place, if the inner circle be made ever so true, the weather could not be kept out; and if it were made to fit very tight, the clock would not go. But admitting for a moment that the clock did go, still the effect of the wind upon so broad a surface would very materially affect it. Other objections, as its bad effect by day-light, &c., might be stated, but I conceive this unnecessary.

Having myself erected illuminated dials upon an improved principle, the effect is far superior to that produced by any that have been erected elsewhere, either in London or the country; a statement in which I am fully borne out by numerous testimonials, as well as by the collateral evidence of gentlemen who have had opportunities of comparing the one at this town which I erected, with those of other places. Some of the advantages of my plan are as follow:—much less expense in the erection; a smaller consumption of gas; the necessity of frequently cleaning the inside of the dial is obviated; a more brilliant light is produced; the light is more uniformly diffused over the surface of the dial; and the effect by day-light is much better than any other. I will just name the principal items which my contracts include. The dial-plate (6 feet 6 inches diameter), and the figures, which are of copper, and glazed with ground glass; the hands, which are also of copper, the figures and hands being gilt; alteration of the clock; laying the gas pipes, and fitting up; erecting scaffolding; mason's work for making the necessary opening in the tower; carpenter's and smith's work; a handsome moulding of cement *round the* dial, 15 inches in girth, which *is painted to correspond* with the stone-*work of the church*, &c. &c. It will be *instantly seen that* copper dials possess great advantages over iron, as they can be made much lighter, and consequently cast a smaller shadow, are less liable to be broken, and will not be affected by the weather.

I think, with F. H. that it is matter of regret that illuminated dials are not in more general use; and the cause, I doubt not, is the enormous expense which it is generally thought they cost. This is, however, greatly magnified; and, I am confident that those of my construction would cost less than that proposed by F. H.

I remain,
Your obedient servant,
JAMES SHARP.

Northampton, July 11, 1832.

HISTORY OF STEAM BOATS—NEW CLAIMANT TO THEIR INTRODUCTION.

Mr. Wm. Bromilow, a correspondent of the Liverpool Chronicle of Saturday last, has brought forward a new claimant to the introduction of steam navigation in the person of a John Smith, late of St. Helen's. Indeed the facts, if authentic, leave no doubt that he has a prior claim to both Bell and Fulton. Mr. Bromilow's statement is as follows:—

"The engine in the boat alluded to, and which is generally supposed to be the first invented, was constructed for propelling boats by steam, as before stated by Smith at St. Helen's, in the year 1793, and her first excursion was down the Sankey Canal to Newton Races, in June in the same year, laden with passengers. On the Saturday following she sailed to Runcorn, from thence down the Duke of Bridgewater's Canal to Manchester. On her arrival there, such was the astonishment and curiosity at this wonderful, and as some would have it, this mad idea, that thousands of the people came from all directions to see what their eyes could not believe, nor their senses understand; and, indeed, such were the numbers, and such the curiosity this vessel excited, that Smith was obliged, for the safety of his property, to give notice that no one would be allowed to come on board of her, excepting those who paid a certain sum. This exasperated the populace to such an extent, that a party of mechanics immediately got possession of, and almost destroyed her. Amongst the visitors was Mr. Sherratt, of the firm of Bateman and Sherratt, of Manchester; also several

other respectable engineers of the same place, whom it is unnecessary to name. So far as memory serves me (after a lapse of 39 years) the following is a short description of this wonderful discovery; but having made no memorandums of the circumstance at the time, and I may say, being then young, and to a certain extent, like the rest of my friends, incredulous, I never anticipated what is almost to every one in the present day, so common. The vessel had on her an engine on the old atmospheric principle, was worked with a beam, connecting-rod, double crank, in an horizontal line, and with seven paddles on each side, which propelled her after the rate of about two miles an hour. John Smith was a rude, uncultivated, self-taught mechanic, and was supported with money by a Mr. Baldwin, at that time of St. Helen's, and was the first aeronaut who ever ascended in a balloon, either in this or the adjoining counties. Perhaps, I may observe, that the vessel or boat was purchased at Liverpool, and on Smith's informing the parties from whom he bought it, what his intentions were, he was treated as some insane person; he was laughed at by one, insulted by another, and pitied generally; but, having money with him, he was allowed to purchase her. On being questioned and laughed at by a merchant at the time the purchase was made, he replied, '*those may laugh who will, but my opinion is, before twenty years are over, you will see this river (Mersey) covered with smoke.*'

"I feel pleasure in giving you these particulars, and the substance of the remarks I can vouch for as being correct, having been an eye-witness to most of them, and one of the party who took his first excursion."

SHIP-BUILDING.

Sir,—In your number of June the 23rd, there was a spirited article on the subject of Naval Architecture. The art of ship building is, I think, at present in its infancy, and this opinion is the result of personal observation in many British and foreign dock-yards. I have thought of many improvements, but there is nowhere to which I can look for the encouragement and assistance requisite to enable me to carry them into effect. The Society of Arts is of no use to a poor mechanic, and it has, to my knowledge, caused the ruin of several.* I wrote to the Admiralty on the subject, and the following is the answer I received:—"Mr. Marsh's letter has been laid before the Lords of the Admiralty, and they will not give Mr. Marsh any further trouble." In my letter I offered to prove that a ship built on a plan I have contrived would possess the following qualities: She would not be liable to break up when driven ashore; *her timbers and planking would never decay;* if built of ash, elm, beach, or common white pine, she would be three times stronger than if constructed of oak or teak; she would sail one-fourth faster than any other vessel; being square rigged, she would sail as near the wind's eye as a cutter; she would never miss stays in going about; her timbers and planking would be fastened together without bolts or treenails; her copper sheathing would be all smooth and fastened on without nails, screws, or any projection on the surface, and without soldering, rivetting, clenching, or cementing; she would carry a fourth or fifth more burthen; she would cost much less in building; a first-rate could be built in a few weeks; masts and yards would be only half their present weight, but double the present strength; and the rudder would be cheap, and such as could be depended upon under any circumstances of distress, its power of action being double that of any other, and instead of two, three, or four men at the steering wheel, a stout boy would be sufficient (by the way, all the alleged improvements in this part of the vessel are, I think, failures). I also offered to prove, that artillery for land or sea service could be made of two-thirds or a half the usual weight of copper or brass, instead of iron, and carry a ball of the usual weight, the expense being nearly the same.

I am nearly seventy years old, and I

* Of course every poor mechanic, who competes for any of the prizes offered by this Society and fails, must be more or less a sufferer; an evil only to be remedied by going much farther than our correspondent would probably recommend, namely, by offering no prizes at all! Some mechanics may possibly have been ruined by such competitions, but have not also very many been benefited by them? It cannot, at all events, be denied that the arts have been considerable gainers by the encouragement given by this Society to new inventions and improvements.—Ed. M. M.

desire to leave some of the knowledge I have acquired by experience behind me, and it is with that intention I address this letter to you, in the humble hope that you will not refuse it a place in your widely-circulated Journal.

I am, Sir,
Your obedient servant,
JAMES MARSH.

26, Hertford street, Tottenham-court-road.

DRAWING PAPERS AND WATER-COLOURS.

Sir,—In the Mechanics' Magazine of July 7, a correspondent, who signs himself "One who loves to learn," states that he has manufactured a paper which has a rough surface, but is of superior quality, for the purposes of drawing in water-colours. That he has so done, I will not dispute; there are many descriptions of the like kind in use at this time, sufficient, I should think, for all the whims of style; but allow me to observe, that the majority of painters in water-colours require a smooth sound surface, and of this quality there is also an abundant supply in the market, provided the dimensions required do not exceed thirty inches by twenty-one; from this size to antiquarian, which is fifty-three inches by thirty-one, the quality cannot be depended on. Whether this arises from a difficulty in manufacturing sound paper of large dimensions, or from the circumstance of having recourse to chemical expedients, I know not; the defect, however, to my own knowledge, has continued during the last thirty-eight years; and I am inclined to think that the absence of improvement may be attributed to that canker-worm to all improvements in manufacture—*competition*. The mortification to an artist, who, after he has bestowed considerable labour on a sheet of paper, and proceeds to lay on his tints, finds them run into spots, may easily be conceived. Nor has he any remedy save that of sponging his paper before he commences his design, and discarding those sheets which are defective, and which such process will render visible. Sound drawing paper of large dimensions is therefore a desideratum which artists would highly value. I suggest this for the consideration of "One who loves to Learn" (he being a paper-*maker), as a subject* worthy of his attention; and if he could only produce such a paper, it would, I am certain, obtain for him equal fame with J. Whatman, who was the original manufacturer of antiquarian drawing-paper.

On the subject of water-colours: artists are better acquainted with the excellent quality of water cake colours which are now available, than to adopt the advice of "One who loves to Learn," who recommends the using of powder-colours in preference. The notion evinces so much want of experience, that it would be needless to notice it, were it not for the purpose of guarding the novice from running into error, useless labour, and worthless expence. He observes that Titian mixed his own colours. Very likely he did, having no other resource. He says, further, that oil painters prepare their own colours. This is erroneous—they purchase them ready prepared in bladders, in the same manner as the most eminent artists in water-colours purchase their colours prepared in cakes, well knowing the judgment of the colourman to be in this respect superior to their own; if it were otherwise, they would nevertheless gladly rid themselves of the trouble of washing, grinding, &c. As for obtaining the colours more pure in an unprepared state, the notion is really too trifling to dwell upon, with one exception, viz. carmine; this colour some artists levigate and prepare in a manner which they keep secret; it is, however, generally known, that a small drop of hartshorn will add to its depth and brilliancy.

I am, Sir, respectfully,
Yours, &c.
OBSERVER.

July 10, 1830.

DRAWING PAPER AND BOARDS.

Sir,—I have read with some attention the lament of J. E. in your 463rd number, on the subject of drawing papers, but really cannot exactly comprehend what the writer wishes.

It is a singular fact, that almost all artists contrive to pick a quarrel with their drawing paper—perhaps like a bad writer with his pen—and that each one discovers a peculiar defect. With some the transparency is a great objection, while others, like J. E., complain of the

want of it; some find it too thick, others too thin; sometimes it is too rough, at others too smooth, and so on *ad infinitum*.

Now, in answer to J. E, I may state, as a fact, that drawing papers are *more transparent* now than they were formerly; and the stiffness and brittleness of which he complains, may be got rid of by using the smaller sized papers, which are the thinnest and most transparent.

The objection of *opacity* is rather curious, when it is considered that the greater number of artists use *drawing boards*, in consequence of their possessing this quality in a high degree.

I may here just observe, that Messrs. Reynolds and Son have lately introduced an improved article of this kind, which they call "the abraded surface drawing boards." These boards are prepared upon an entirely new principle, and although possessing the usual smoothness of the London boards, they retain free from greasiness the tooth or grain of the paper; a quality which renders them superior to those hitherto produced. They have been tried and approved of by several of the first artists, and are strongly recommended both for pencil drawing and colouring.

J. E. appears to be unacquainted with the fact, that all drawing papers, of whatever quality, pay an equal rate of duty—three pence per pound. This, therefore, forms no obstacle to continued improvements in quality.

J E. also speaks of the difference between "linen and cotton fibres"—"shortness of filament"—"length of texture," &c., in a manner that is exceedingly fanciful, and which exhibits much want of practical information on these points.

I would suggest, that an hour spent in the Derby paper-mills, would not be thrown away; and I may observe that *drawing papers* are made by Messrs. S. Evans and Co. of that town.

I remain, Sir,
Yours, respectfully,
WM. BADDELEY.

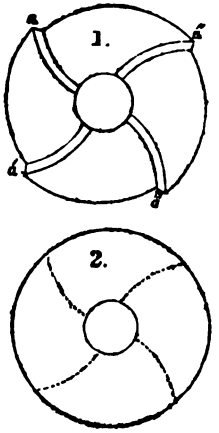
July 6, 1832.

P. S.—Since writing the above I have seen the communication of "One who lives to Learn" in No. 465, and am happy to recognise in the writer, a gentleman who has paid more attention to *paper* in connection with *colours* than any other manufacturer. *This writer* confirms my statement respecting the superior transparency of modern drawing papers. With respect to that gentleman's assertion, that the transparency is injured by the addition of smalt, I must beg leave to differ from him. And this point may be settled by comparing thin yellow-wove post, which contains no smalt, with thin blue-wove post in which the smalt is in excess. The transparency will be found nearly equal, but what little difference there is will be in favour of the blue-wove paper; and this is what might be expected, reasoning on optical principles.

W. B.

July 10, 1832.

CENTRIFUGAL ACTION.



Sir,—Seeing in one of your late numbers something on the subject of centrifugal action, which once engaged my thoughts, I beg to submit the following hints.

First—Suppose the arms of a mill-wheel were boxed up and immersed in the water, as in figure (1). Here the arms are seen curving out from a chamber, communicating with the perpendicular tube shaft. My problem here is, Would the advantage gained by the increased resistance at the exit orifices, *a a''*, &c., counterbalance the increase of friction incurred by working under water?

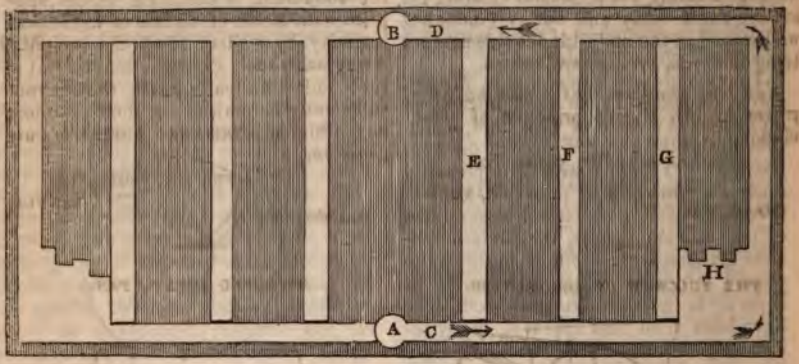
Second—Connected with the above, I beg to add a similar improvement in the centrifugal pump. Instead of having arms, as in the original motion, I would have two circular plates parallel, e m-

nected together by curved partitions, like a flat round box without sides.

In figure 2 the dotted lines mark the partitions coming out from the mouth of the descending tube shaft. This must work in a trough of water, through the bottom of which the tube shaft descends, working in a stuffed collar. The partitions produce the same effect as the arms, and throw the water out from the box into the trough, causing a vacuum, which, if the motion be kept up, can only be supplied from below.

I am, Sir,
Yours, respectfully,
Φ. M.

VENTILATION OF COAL MINES.



Sir,—Some observations have been made in your work respecting the ventilation of coal mines, and, as I superintend the working of my own mines, I may be able to add a few useful remarks on that subject.

Davy lamps (though highly useful in emergencies) I consider as injurious to workmen generally; men ought not to be allowed to work for long together where a naked candle will not burn safely.

Above is the simple plan upon which my mines are ventilated, being an improvement of my own upon a plan long in partial use in this district.

Let the diagram represent a coal-field (though it must not be considered as showing the proportions of the real work), A the working pit; B the ventilating pit; and let the dip of the mine be from B to A, the pit A being deepest. These pits are sometimes very difficult to sink, owing to foul airs and water, but such difficulties must be overcome as they can. When sunk to the coal, let the gangway C, and the air road D, on one or both sides of the pits be driven forward as far *as circumstances will* permit, and then let them be joined by the road E; there will now be a free ventilation from A to B, and oftentimes to increase the current by a stream of hot air, a fire-place and tall chimney are built over the pit B. Next push forward the gangway C and air road D as far as convenient, and again join them by the road F, stopping up the communication through E. Thus continue to the extremity of the coal intended to be got, and there will then be a regular ventilating current round the work, all gases being driven, or escaping through fissures into the air-road D. This side of the field is now complete for getting the body of coal; and though these roads are often difficult and expensive to drive, owing to want of ventilation, yet they can be accomplished by known means, amongst which the Davy lamp is a very useful one, and, when completed, the work is clean and secure for many years. The men are now always in a current of fresh air, and must begin to clear the field in the part H, working upwards and bringing the coal along the gangway C to the pit A. All gases escape from them through the road D, there being a perpetual draught up B.

When they have cleared to the top, the road G must be opened, and the work proceeded with as before until all the coal is got to the pit A. Thus the men leave all hollows for accumulations of foul air behind them, whereas in many works the men, by having got the coal near to the pit A at first, have constantly, at great hazards, to bring all the far coal through a region of foul air. The only way to have a clean good work to the last is to get the distant coal first, leaving nothing for a second clearing; but the extra delay and outlay (though well repaid in the end) hinder this mode being adopted, even where known.

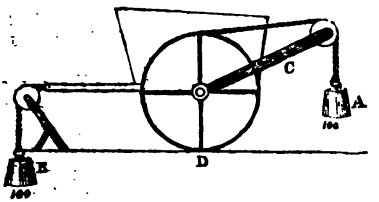
You will perceive that I am an approver of Mr. Ryan's principle of ventilation.

I am, Sir, yours, &c.

SAXULA.

July 4th, 1832.

THE FULCRUM OF LOCOMOTION.



Sir,—"Let him attach his power to the cart, and he will have locomotion, but a shifting of the fulcrum from the ground to the axle."—This is the remark of Mr. Cheverton, at page 157. I have done so in the above diagram, and the fulcrum is still on the ground. If this were not the case, how can the backward force A of 100 lbs. acting on the rim of the wheel countervail the force of 200 lbs. acting forward — viz. the pull of the weight B of 100 lbs., and the reaction of the prop C of another 100 lbs. against the axle, which it will do (making due allowance for the oblique action of A upon the axle)? I should not have troubled you again on the fulcrum question, but for the foregoing direct challenge, which, if unanswered, might, perhaps, have appeared invincible. If any one can explain the equilibrium of these forces, on the principles of mechanical science, without making the fulcrum at D on the ground—I will give up the contest.

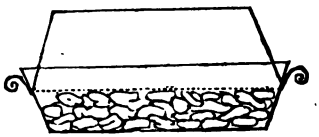
I am sorry I used the offensive word mentioned by Mr. C; but, in justification of my opinions — are not the boilers upon the Liverpool rail road with their water, from 2 to 4 tons weight? And all to keep up constant steam of 50 lbs. per inch on the pistons of a pair of cylinders, which might, according to the statements I complain of, be supplied with steam of double or treble that intensity by boilers of ¼ the weight? Away with such exaggerations! But if such boilers do really exist, they cannot sufficiently be praised, or their inventors be too highly rewarded. *I want to purchase one.*

I am, Sir, yours, &c.

SAXULA.

June 26th, 1832.

IMPROVED POTATO PAN.



Sir,—In the Mechanics' Magazine for March, 1832, page 408, you have given an account of a "newly-invented utensil which will enable the most ignorant to dress potatoes in perfection, and diminish the trouble of cooking," which to your numerous class of readers is of importance, both as a matter of taste and a saving of time. I prefix an outline of an *old-fashioned utensil* that has been used in my family for some time, and I can speak of its merits practically. The potatoes well washed are put without water into an iron vessel; another vessel that fits close is inverted over them, and both are then placed in an oven. In about half an hour, or according to the heat of the oven, the potatoes are ready for use, and have all the excellence of a well steamed mealy potato, and are neither watery nor unpleasantly odorous. Some persons use a common bread tin placed on the bottom of an oven, and

place the cast-iron oven or plate on the top of the tin.

I am, Sir,
Your obedient servant,
HANNAH ——.

Rippon, June 6, 1832.

APPLICATION OF GALVANISM TO THE BLASTING OF ROCKS. BY ROBERT HARE, M. D., PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF PENNSYLVANIA.

An account has lately been published of the death of a workman near Norristown, dreadfully bruised and lacerated by the blasting of a rock. I have ascertained the process for blasting rocks may be rendered safer than the firing of a fowling-piece, by a new application of galvanism. I was led to make this improvement in consequence of an application by a patentee (Mr. Moses Shaw) for assistance in perfecting his patented mode of blasting rocks by an electric discharge from a Leyden jar. In a letter dated June the 1st, 1831, he says, "I have been engaged in blasting rocks by means of a fulminating powder introduced into several cavities, and ignited in all of them simultaneously, by a spark of an electrical machine, by which means masses of a much larger size, and of a much more suitable shape for any object in view, may be procured, than by the old plan. I have, however, to lament my inability to succeed in this method of blasting during a great part of the year, when, in consequence of the unfavourable state of the weather, the ignition cannot be effected by electricity in any mode which I have devised, or which has been suggested by others, although I have consulted all the best-informed professors to whom I have had access." It occurred to me, as soon as this statement had been made by Mr. Shaw, that the ignition of gunpowder for the purposes he had in view, might be effected by a galvanic discharge from a deflagrator, or calorimoter, in a mode which I have used in my eudiometrical experiments to ignite explosive gaseous mixtures. This process is free from the uncertainty which is always more or less attendant upon the employment of mechanical electricity for similar purposes. The expectation thus arising has since been fully verified. I have ignited as many as twelve charges of gunpowder at a distance of one hundred and thirty feet from the galvanic machine employed. This distance is much greater than is necessary for the safety of the operator, as the deflagrator may be shielded so as not to be injured by the explosion; and by means of levers and pulleys it may be made to act at any distance which may be preferable, there is no limit to the number of charges which may be thus ignited, excepting those assigned by economy to the size of the apparatus employed. These remarks have reference to the principal and highly important object of Mr. Shaw's project, which is, to ignite at once a great number of charges in as many perforations, so drilled in a rock, as to co-operate simultaneously in the same plan. By these means it is conceived that the stone can be separated into large prismatic or tabular masses, instead of being reduced into irregular fragments of an inferior size. The object to which I propose now to call attention more particularly is, a modification of the common process of blasting by one charge, which renders that process perfectly safe. This part of the subject I shall introduce by premising that almost all the accidents which have taken place in blasting rocks have occurred in one of the three following modes:

1st—The explosion has taken place prematurely, before the operator has had time to retire.

2nd—A premature explosion has ensued from a spark produced by the collision arising from ramming into the orifice of the perforation, containing the powder, brick-dust, or sand employed to close it.

3rd—The fire not reaching the charge after the expiration of a period unusually long, and the operator returning to ascertain the cause of the supposed failure, an explosion ensues when he is so near as to suffer by it, as in the instance near Norristown, lately published.

The means of communicating ignition to which I have resorted, are as follows:—Three iron wires, of which one is of the smallest size used for wire gauze, the others of the size (No. 24) used by bottlers, are firmly twisted together.

This is best accomplished by attaching them to the centre of the mandril of a lathe, which is made to revolve while the other ends of the wires are held by a vice, so as to keep them in a proper state of tension. After being thus twisted, a small portion is untwisted, so as to get at and divide the larger wires by means of a pair of nippers. In this way the smaller wire is rendered the sole means of metallic connection between the larger ones. These are hid in a saw kerf, so made in a piece of dogwood as to secure them from working, which, if permitted, would cause the smaller wire to break apart. At one end the twist formed of the wires is soldered to the bottom of a tin tube of a size to fill the perforation in the rock to such a height as may be deemed proper. This tube being supplied with gunpowder, the orifice is closed with a cork, perforated so that the twisted wire may pass through it without touching the tube at any point above that where the finer portion alone intervenes. To the outside of the tube, a copper wire, about No. 16 is soldered, long enough to extend to a copper or leaden rod proceeding from one of the poles of a galvanic deflagrator, or calorimoter. The wire passing through the cork to the inside of the tube is in like manner made to communicate with the other pole. The connections between the wires, rods, and poles, should be made by means of soft solder, previously to which we must imagine that the tube has been introduced into a perforation made for its reception in a rock to be blasted. The tin tube may be secured within the rock by the usual method of ramming in brick-dust and sand by means of a punch, having holes for the protection of the wires of communication already described. The apparatus being thus prepared, by a galvanic discharge, produced by the movement of a lever through a quarter part of a circle, the finer wire is ignited in the place where it intervenes solely in the circuit, so as to set fire to the surrounding gunpowder. As the inclosure of the gunpowder in the tube must render it impossible that it should be affected by a spark elicited by ramming, as no means of ignition can have access to the charge besides the galvanic discharge; and as this can only occur by design with an intention to commit *murder or* suicide, or from unpardonable neglect, it is inconceivable that an explosion can take place in the method of blasting, when any person is so situated as to suffer by it. It must be obvious, that in all cases of blasting under water, the plan of the tin tube and iguition by a galvanic circuit must be very eligible.

CROSBY PLACE AND THE GRESHAM LECTURES.

Sir,—Crosby-place, or, as it is now generally called, Crosby Hall, in Bishopsgate-street, was erected by Sir John Crosby, Knight, about the year 1466; after having been the residence of Princes, Mayors, Sheriffs, Ambassadors, and, eventually, of persons of lower degree, it at length became converted into a packer's warehouse, for the purposes of which it was sadly mutilated and disfigured. Indeed, the present state of this once splendid building, is a disgrace — even to "a nation of shopkeepers."

It gives me great pleasure, however, to state, that some gentlemen in the City have determined on its restoration; and there is good reason to hope, that the Gresham Lectures will be delivered here in lieu of the obscure room over the Royal Exchange; and that with the removal, an alteration will take place in the *times of delivery*, and also in the *character* of the lectures.

Sir Thomas Gresham ordered the lectures to be delivered *daily*, but they are now limited to Term time, and delivered at an hour when few have the power, though, perhaps, many the will, to attend them.

The salary of each Professor is £100 per annum; for which, I think, between them, two evening lectures per week might be afforded, and which would be all the better if made intelligible, interesting, and instructive.

The restoration of this interesting and still beautiful wreck of a once magnificent structure, and the removal thereto of the lectures, founded by the liberal and patriotic Gresham, are objects which I devoutly hope we shall shortly see carried into effect.

This arrangement will, I doubt not, meet the wishes of F. H., as expressed in his communication at page 255 in your last number.

The accomplishment of these desirable objects will reflect the highest credit upon their promoters, and be alike an honour to the City and the times in which we live.

I remain, Sir,
Yours, respectfully,
WM. BADDELEY.

July 16, 1832.

THE SHAKING EFFECT OF ENGINES ON STEAM VESSELS.

Sir,—In a recent communication to your Miscellany, I made use of the term "vibration," as applied to that tremulous or shaking motion so sensibly felt in steam-boats, and remarked that it was greatest in those boats which are of the slightest construction. From the observations since made by Junius Redivivus, I perceive that I was unfortunate in my selection of the word "vibration" to express that peculiar effect produced by power engines upon weak boats. "Vibration" does certainly suppose a compactness (if I may apply such a term here) between the parts, the very opposite of that state to which my remarks were applicable. I rather think, that if J. R. will trouble himself to notice the effects of the engines upon different vessels, he will find, that in those, the parts of which are connected together in the best manner—the *elasticity* is so great as to deaden the continual impulses of the engine, much in the same way that the elastic springs of a carriage prevent the excessive jolting on rough pavement.

I am, yours, &c.
GEORGE BAYLEY.

July 7, 1832.

IMPROVEMENTS IN SHIPS' RUDDERS.

Sir,—In the Athenæum of June 2nd, there is an extract from a Report of a Committee of the New York Nautical Institution on ships' rudders—from which it appears, that the committee of that Institution have come to the conclusion that no improvement can be made upon the present method of constructing ships' rudders, and (important information!) that long tillers are preferable to short ones—"because, in case of the tiller ropes giving way, it could be more easily *managed, &c.*" *i. e.* a long lever will *overcome a certain* resistance with less power than a short one! Then follow some cautionary remarks upon the strength of the pintles and braces, which certainly do not tend to impress my mind with a very high notion of the *practical* knowledge of the members of the Committee of the New York Nautical Institution. In the course of 19 years' experience, I never saw braces carried away whilst the pintles remained entire. We have next some advice about providing for the easy removal of the rudder in case the braces give way. I am, however, inclined to think that, for the security of both the ship and its rudder, the round-headed rudder is the best. It may be made to fit very accurately into a well-secured trunk; so that in case of its braces or pintles being carried away, it might, with the assistance of a hawser at its heel, be made to perform its duty with advantage; or should it be entirely carried away, the trunk would form a good bearing for the upper part of a temporary rudder to work in, and, if of any length, would greatly tend to steady it. You will excuse my troubling you with these remarks; but when committees of Institutions, like the New York Nautical Institution, fill their reports, or occupy the public attention with mere *twaddle*, they must expect to be commented upon by

ONE OF THE PEOPLE.

NATURE OF COMETS.

Mr. Editor,—I thank you for the insertion of my letter on the "Nature of Comets" in your Magazine for May, p. 75, because the ideas therein contained are now gone out into the world; and I think it probable they may be thought more worthy of attention fifty years hence than they are just now. I also thank your two Correspondents, Messrs. Wall and Baddeley, for the notice they have taken of my letter, pp. 99 and 117, and am happy to find their objections so perfectly innocent, that I am satisfied they will not, on more mature reflection, consider them as militating against the theory I have advanced. I might point out various instances of inaccuracy in their reasonings, and of the inapplicability of those reasonings to the contents of my letter, but this would take up too much of your valuable space. I would just whisper in Mr. Baddeley's ear that it might not have lessened

his claims to respect had he spared the quotation from Pope, &c. in reference to me and my opinions; for whether I possess *little* sense, or *great* sense, or *no* sense, that is not a question he was called upon to decide. I do hope that I possess *common sense* and *common decency of manners* sufficient to prevent me from either insulting an opponent, because he dares to exercise his thoughts on a subject beyond my own sphere of contemplation, or from calling his opinions "palpably erroneous," because I do not understand or have not duly considered them. But to proceed:

I am sorry Mr. Wall has in some measure deprived me of the great corner stone upon which part of the analogy of my reasoning is founded, by *denying that our earth is reserved for fire.* Supposing, however, a conflagration were to take place, contrary to this gentleman's expectations, *by the too near approach of a comet*, or from some other cause, why should we infer that this earth would thereby become annihilated? I apprehend it might still retain nearly its present size, although not its density. However, I said nothing at all about the *destruction* of the earth by fire; I only spoke of its *purification*, and *that* with a view to future habitation, either under our own or some other system of being.

Mr. Wall observes, "We must suppose the comet to be fired exteriorly by the superior power of the sun, which J. F. justly allows can illuminate only the half turned towards that luminary; the rays of light can then only be thrown from its enlightened sides. *What becomes of the tail?*"

It cannot surely be necessary to inform this gentleman that were a sufficient degree of heat confined to any single point, by the revolution of our earth, the *whole* of its circumference would be exposed to its effects in twenty-four hours. As to the *quickly consuming* and *emblazoning* quality of fire, of which he afterwards speaks, his observations would certainly have some weight if we were to suppose our globe to be—a globe of straw. So also, when he speaks of the possibility of a tremendous earthquake blowing the world to atoms; this would demand *some* consideration if we were to consider our earth similar to a bottle filled with smoke or inflammable air.

Mr. Wall accuses me of ascribing the peculiar orbits of comets to "the medium of fire having driven them from their circular revolutions round the sun." Now I said nothing whatever of the kind; (I should be sorry to talk nonsense). Your readers must be aware that I spoke only of those two great laws of nature, *gravity* and *attraction*, being disturbed or altered by the medium of fire, and who can tell what momentous effects might be produced by such a cause on a globe equipoised and at perfect liberty in the air?

Mr. Wall says, that "when the comet is in a *direct line with the eye of day*, its tail may be seen at its greatest extent." Here evidently there must be a grand mistake, for in that case it could not be seen at all. As to the *bearded* appearance mentioned by Mr. Baddeley, how much more reasonable to suppose it to arise from the *conflagration of the globe itself* than to suppose it to arise from the *brushlike extremity of its tail*, which must be probably millions of miles in the rear of the body of the comet, and consequently in its appearance very faint (admitting *such* a tail to exist, which I do not)? However, it will be perceived that Mr. Baddeley's tail is very accommodating, for after it passes its perihelion, he says it *gradually decreases*;* but when it arrives at its aphelion, then he discovers the splendour of its brush-like tail, and finds it so exceedingly handy, that, like the spreading of a peacock's tail, it is made just to fit. Fit what? Mr. Baddeley's purpose!!!

With regard to what this gentleman says about the distinct *rays* or *streams of light* which have appeared in the tails of comets, and their appearing *variously curved*, it is all perfectly correct, and what we might have reasonably expected under such circumstances, *admitting the theory I have advanced to be correct.* For instance, we know that our earth, generally speaking, is composed of *stones, metals, chalk, clay, loam*, &c., yet we also know that in many parts are found immense mines or beds of *coal, nitre, sulphur, bitumen*, &c.; and why should we be surprised if such highly-combustible and inflammable materials were, when once ignited,

* That it appears *gradually to decrease* as it recedes from the sun is perfectly correct, for its length and brilliancy must of course be very considerably affected by the gradually *oblique direction* in which it must be seen by us, and also by what we might term its twilight; but the effects of the reflection and refraction of the sun's rays on the atmospheric air appear entirely to have escaped the notice of both Mr. Wall and Mr. Baddeley.

to ascend with tremendous force in strong volcanic streams or columns of fire and luminous vapour, while the stones, metals, &c. remained only awfully luminous?

That in the case of comets such streams or columns of fire and luminous vapour should *appear*, and that they should also ascend *obliquely* or in *curved lines*, is just what we might naturally expect; for were they to ascend to such an immense height *perpendicularly*, this would be contrary to all known facts of a similar nature, and would bespeak such a dead calm in the atmosphere as we have no reason to expect on this or on any other globe in motion. Again, that stars should be seen *through* the illuminated atmosphere of a comet, is also perfectly reasonable; and that such facts have been known and recorded, not only corroborates all the other views I have taken of the subject, but is a presumptive evidence of the truth of the premises I have laid down.

With these remarks, and with every kind feeling towards your other correspondents, Messrs. Wall and Baddeley,

I am, Sir, yours, &c.

Cranbrook, J. F.

ON OILING RAILWAY-CARRIAGES. BY MR. J. L. SULLIVAN, CIVIL ENGINEER, BALTIMORE.

(From the Journal of the Franklin Institute.)

There is no difficulty in oiling axles continually, but to do it so as not to waste a drop of oil, has not been done, I believe, till the latest improvements in the friction-saving carriage of the Baltimore Rail-road, where very accurate experiments have been making by Mr. George Brown, one of the principal proprietors of that work; the result of which, he informs me, is, that one quart of oil will be sufficient for 2000 miles' run of a carriage, which, with its load, weighs 3 tons. He informs me, at the same time, that he has ascertained that the Lehigh railway-carriages consume 4 quarts in running 821 miles with 1 ton. This, it will be perceived, is nearly 30 times as much. The manner of oiling the Winan's waggon is peculiar to its construction as now improved. The secondary wheels now run in a cast-iron case, the top of which is formed so as to affix to the under surface of the side timbers of the frame of the waggon. Its sides sustain the axle, and are supported or joined by an intermediate part or bottom, which forms a tight case, into which the oil is put, so that the friction-wheel dips into it, and its rim carries up a little of it continually to the rubbing and rolling surfaces, returning it to the reservoir; thus oiling its own axle, where all the rubbing is situated, and the rolling-axle, and no more is consumed than evaporates. Its enclosure keeps it clean. I need not remind the reader that the use of oil on axles is not only to keep the surfaces from actual contact, and grinding together, but to keep them cool, and this is better done by the successive application of new portions of oil than by keeping the same oil on the axle as long as it will last, partaking of the heat the axle requires, and therefore evaporating the faster. This method must therefore be of consequence when great velocity is to be given to heavy loads.

J. L. S.

We extract the following additional observations on the subject from the minutes of a monthly meeting of the Franklin Institute, June, 1831:—

"Geo. W. Smith, Esq., to whom was referred the question, "What is the best unguent, and the most economical mode of its application, to diminish the friction of railway-cars, locomotive-engines, and other machinery of similar construction?" stated, that the result of several experiments which have recently been made have led to the conclusion, that the finest quality of sperm oil most effectually relieves machinery from the effects of friction. As the experiments above alluded to were still under consideration, and others about to be tried, to test the correctness of the conclusions already drawn, he requested that the consideration of the question should be named for discussion at a future meeting, and assured the meeting that as soon as the decision of the final experiments should be known, he would lay the results before the Institute.

"Professor A. D. Bache remarked, that Mr. Wood's experiments on the friction of railway-carriages had shown the fact to be in that case, as stated by Mr. Smith; and that those of Rennie led to the conclusion, that the nature of the unguent should bear some relation to the weights to be supported, or resistances to be overcome, the more fluid unguents applying best to light loads.

"After which Mr. J. M'Ilvaine stated, that in using the various kinds of unguents on his machinery, he had come to the same conclusion as that stated by Mr. S.,

that the best quality of sperm oil was the most beneficial: having considered it as a question of much importance, he had devoted a considerable time to the subject, and was very particular in making his observations. He further remarked, that the oil should be carefully cleansed, and deprived of those parts which water could remove."

A FEW WORDS IN BEHALF OF THE DIAK SWORDS AND MR. DALTON.

Sir,—I have often been puzzled to discover the drift of the communications of the gentleman who has adopted the terrifying signature of "Junius Redivivus," but never so much as in the case of his letter on Diak Swords, in the Mechanics' Magazine of last Saturday. It appears to me to be a mass of contradictions,—a wall thrown down as fast as it is built,—a series of assertions demolished as soon as made,—and that, too, by the cannibal author himself.

Thus he opens his battery by observing that the article on which he is giving his strictures "would seem all very wonderful and mysterious," but that "there really is nothing remarkable in it"—yet, before he gets to the end of this paragraph, he denounces the writer of that very article as "simply a taker of wonderful stories for gospel," and declares war upon the assertion which is *not* "wonderful and mysterious," and has "really nothing remarkable in it," by announcing himself as "somewhat addicted to the destruction of *superstitious stories* savouring of *enchanted weapons!*" Pretty well this to begin with; and the rest of the letter does nothing to disgrace such a commencement. Mr. Dalton, it appears, asserts that, with the swords in question, "he had several penknives shaved to pieces by way of experiment," whereupon Junius observes, "that a properly tempered penknife could be shaved to pieces by any instrument that ever left an earthly forge, I utterly deny." Yet this vehemently-denied assertion forms part of the very narrative which is said *by the same authority* to have "really nothing remarkable in it," although it may "seem all very wonderful and mysterious!" There surely must be something rather wonderful in a weapon which does more than 'any instrument that ever left an earthly forge;' and *that it is also tolerably mysterious*, is *evident from the fact that even the clear-sighted Junius*, with all his 'travelled parts,' cannot see how such a thing can be made. As to Mr. Dalton's veracity, that we must leave as we find it;—our business is with his statement just as it appears: even Junius admits that the terrible shaving feat might be done on penknives not properly tempered,—"exportation ones, thought good enough for India." He is thus completely on the horns of a dilemma;—if the thing could be done, where is the "superstitious story, savouring of enchanted weapons"—if it could *not* be done (by any earthly instrument), is there not something "wonderful and mysterious" about it?

But all this is nothing to what follows. At the bottom of one column, Mr. Dalton is laughed at for *seeing* an old musket barrel chopped to pieces by a mandow, and for *believing* his Indian friend, who sneered at the inferior powers of the Sultan of Coti's swords, which cut a musket-barrel only half through, and assured his English visitor that his own would have cut quite through them at every stroke. For broaching this notion, poor Seljie is set down as "a sly, good humoured Indian jester, who laughed in his sleeve at the credulity of his wondering Sahib guest." Yet, how does the very next paragraph commence?—"That a heavy sword of Wootz steel, well tempered, would chop an iron musket-barrel to pieces, is surely— (what? incredible? ridiculous? impossible? no!) is surely nothing miraculous, when the construction of it is taken into consideration!!!"

Let us take breath, and rub our eyes a little: then, after convincing ourselves that the words are really on the paper before us, how can we help asking why the mere dry mention of a fact should procure a man the reputation of "a sly, good-humoured jester"? and why a man should be reproached with credulity for believing a very possible and probable event to be true?

But the game of fast and loose is not finished yet: after the point-blank sentence we have copied, after even giving a section of the probable form of the weapon, after taking the feat quite as a matter of course, by observing "the edge must have been of the kind I have described, *or it could not have stood to its work on the barrel*,"—after all this, the ingenuous Junius caps the climax of contradiction by asserting, in spite of his (own) teeth,

that "a regulation musket-barrel would defy the force of any human arm to sever it while held in human hands!!!" Which are we to believe, Junius at the top of the column, or Junius about half-way-down? A duel between these conflicting parties must certainly be the result of such public giving the lie!

I can spare no more time and paper on the subject, or I should be tempted to inquire, why the excellence of the temper of a Walby's trowel, which will cut through a poker, proves that the Diak mandows will not cut through a gun-barrel? Whether it is not reasonable to conclude, that if cold hammering be the most important process in tempering steel, the Indian cutlery may not be superior to the English, since this must be done by hand, and the time of the Indian smith is of little importance, while that of the English workman is too valuable to bestow much of it on articles sold wholesale? And why it is so outageously incredible that in Borneo, "the farther a person advances into the interior of the country, the better he will find all instruments of iron"—an idea so preposterous, it seems, that Mr. Dalton is declared to "beat the Runic smith hollow"—the said Runic smith being the gentleman who cut a man in half without his knowing it (till he shook himself in two)! and, moreover, a great friend of Junius (Redivivus) on all occasions? I remember he figured in an article on Damascus blades, in "The Tatler," from the same hand, in which the writer of the "History of Iron and Steel Manufacture," in Lardner's Cyclopædia, was treated something like poor Mr. Dalton, alternately reviled for dealing forth miraculous stories, and sneered at for thinking them any thing wonderful!

Hoping I have not said any thing to prove myself an *ill-tempered blade*,

With best respects, I am, Sir,
Yours respectfully,
SOLOMON SECUNDUS.

Boiler Safety Plates.—"I cannot inform F. T. (page 191) what pressure the surety plates, mentioned in No. 45[5], sustained before they discharged the steam; my experiments on that head are not sufficiently minute and correct for publication. The *thickness of the lead* required for any assigned pressure must depend on the *size of the opening* over *which it is placed*, and that opening will, of course, *be regulated by the size* of the boiler. F. T. has not *named the size of the* orifice in his experiment.—*SAXULA, July 6, 1830.*"

Edinburgh and Dalkeith Railway.—A train of carriages for the conveyance of passengers has lately been placed on this railway. The novelty attracts crowds of visitors.—*Edinburgh Paper.*

The London and Birmingham Railway Bill has been thrown out by a Committee of the House of Lords, by a majority of 12 to 7.

Hot Air Blast.—It appears, from a paper by Mr. T. B. Neilson, lately read at the Institution of Civil Engineers, that the weekly consumption of coals at the Clyde Iron Works has been reduced, by the adoption of the heated blast, from 1800 to 600 tons; while, at the same time, a greater quantity of iron has been manufactured.

A Machine to keep off Flies.—We have employed for this purpose an apparatus intended for another, and which is no larger than a quart mug; we allude to the spring roasting-jack, which is wound up like a clock, and will run for an hour or more. The fanning, or fly-driving, apparatus, occupies the place of the meat, and, instead of roasting the dead animal, the living one is cooled and protected from the flies.—*Dr. Jones—Franklin Journal.*

Spontaneous Combustion of a Balloon.—A new balloon, made by Durant the aeronaut, was destroyed by spontaneous combustion at Jersey city, a short time since. It was about 100 feet in circumference, containing nearly 600 yards of silk. It was dipped in a varnish composed of linseed oil, spirits of turpentine, and gum elastic in the morning, and no appearance of heat was observed about it in the evening. After having been suspended in the open air all day, it was folded up and laid upon four Windsor chairs, exposing an upper surface of about 15 feet. In the morning a slight appearance of smoke was observed by the servant, who opened the door and found the whole mass of silk blackened and carbonized except a part of the outside folds. About a quarter part of the seat of one of the chairs was perfect charcoal, and the others were scorched.—*New York Paper.*

Mechanical Skill of the Ancient Egyptians.—A paper was read, on the 11th of last month, at the French Academy of Sciences, by M. Jomard, which shows, from the hieroglyphic remains found on the Egyptian monuments, that most of the principal mechanical instruments with which we are now acquainted were known to them. In a picture found in the Palace of Carnac, are seen a vessel fixed by means of anchors, and a capstan in connection with it; it is also seen from it that the ancients were acquainted with the vice. It appears to be by means of inclined planes and capstans that they raised the immense blocks of stone of which their great monuments are composed. M. Jomard also proved that they knew the use of the pulley.

INTERIM NOTICES.

We shall be glad to enrol our Yorkshire friend T. W. among our regular correspondents.

S. P.'s complaint has taken us by surprise. We have no present recollection of the "valuable invention" to which he alludes, and must, we presume, have overlooked it. We shall, however, look into his papers again.

Communications received from Mr. Pilcher—A. S. R.—B. D.—A Manchester Mechanic—E. G. P.—Mr. F. Courtney—M. P.—Mr. Dousbery.

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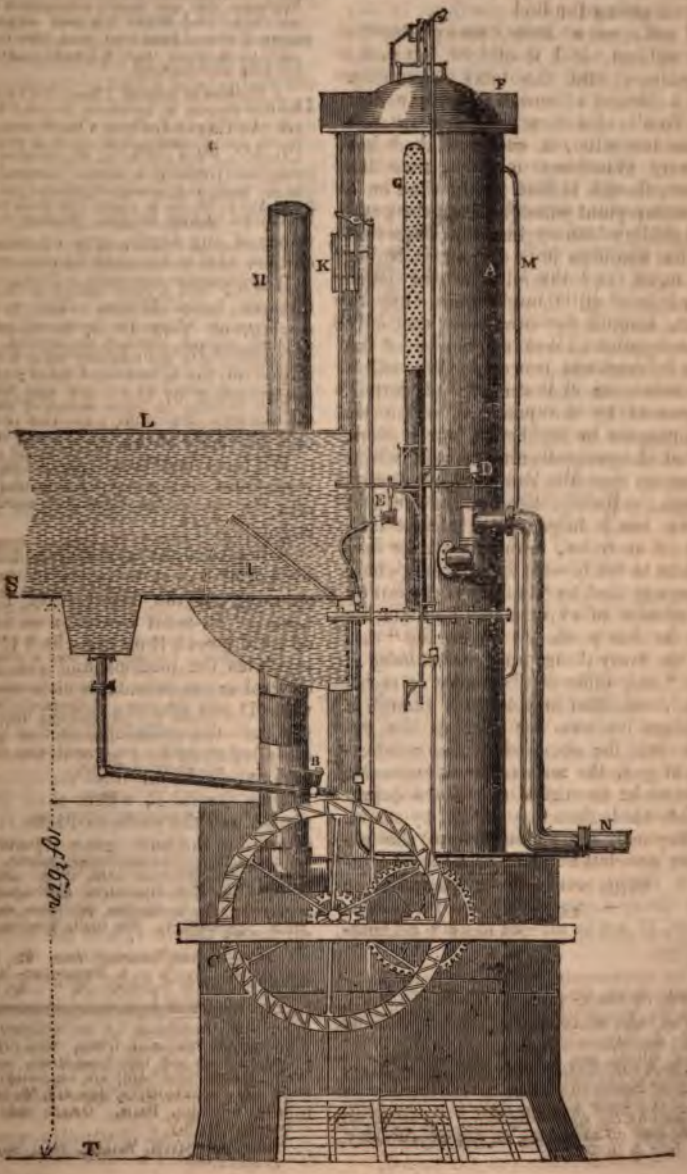
THE CROYDON CANAL GAS VACUUM ENGINE.



THE CROYDON CANAL GAS VACUUM ENGINE.

On Mr. Brown's principle.

Every person must recollect the great stir which was made a few years ago about the Gas Vacuum Engine invented by Mr. Samuel Brown (fully described and illustrated by engravings in our 2nd vol., page 386); the prodigious expectations which it excited, but failed to realise; and the total obscuration which seemed afterwards to come over it. To all who then took any interest in the invention, it will now doubtless be very gratifying to learn, that Mr. Brown, though baffled for the time on a particular point which affected the practical utility of his engine, did not on that account abandon it in despair; but that he has, on the contrary, by a long course of persevering, though quiet experiment, completely overcome the only difficulty which stood in the way of the most triumphant success. We affirm this much on the strength of certain statements by the patentee, which we now propose to lay before our readers, and of the general correctness of which we see no reason to entertain any doubt; though, certainly, here and there Mr. Brown has indulged in a greater latitude of assertion, than it might be easy for him to verify—as, for instance, where he asserts that he "is fully borne out by the results of experiments," in stating that he has produced an engine "that will do every thing, and *cost nothing!*" The "only difficulty," it may be recollected, consisted in this, that though a sufficient vacuum for working the engine could be obtained by the combustion of gas, the *means* were so expensive as to make an engine so worked dearer on the whole than one worked by steam. If, however, the statements of the patentee are but one half true, a gas vacuum engine can now be worked at so very cheap a rate—in a great many situations, if not in all—as to defy all competition.

The statements we allude to are contained in three papers, which we shall, for the sake of reference, distinguish as A, B, and C.

A is a circular, of date the 1st of May, 1832, announcing that Mr. Brown was *then ready to "contract for the construction of gas vacuum* engines of any power" and "to guarantee their working for any number of years at half the annual expense of steam engines of the same power, and in the same situations;" and referring to the following engines as having been already constructed by him, and to two of them as being in constant and successful operation.

1. On the Croydon Canal for raising water from a lower to a higher level.

2. At Soham, in Cambridgeshire, for the drainage of a part of the Middle Fen District.

3. At Eagle Lodge, Old Brompton.

4. Do. do.; but of a different construction from the three preceding engines, being one "by which water may be raised to any height, or pumped from mines of any depth, and by which machinery of any sort may be propelled."

B is a paper containing copies of certificates from Messrs. George Mainwaring, of York Gate, Lambeth, and Mr. James Burton, Bankside; the Committee of the Croydon Canal; the Superintendent of Do.; all bearing very satisfactory testimony to the economy and efficiency of the engine No. 1.

We have ourselves seen this engine at work, and on the front page of the present No. we present our readers with an engraving of it.

A is a wrought iron cylinder, 22 feet high and 3 feet 6 inches in diameter, standing in the lower level T of the Canal. To set it to work, water is turned by the cock B on the wheel C (which regulates the motions and the number of strokes per minute) which opens the valve D and admits a certain quantity of gas into the cylinder: this is immediately inflamed by a jet of lighted gas, E, and expels the air from the cylinder by raising the lid F, which then instantly shuts; and the perforated tube G, which is fed by the outer pipe H, giving out its water, cools the cylinder instantly, completes the vacuum, and raises the water in the cylinder 7 feet above the discharge nozzle I, and the upper level S; the atmospheric valve K is then opened, and the water rushes out of the discharge valve I into the canal through the shoot L, and the stroke is completed. The height to which the water ascends in the cylinder is indicated by the glass tube M. N is the pipe from the gasometer.

C is a paper of illustrative remarks by

the patentee, which it will be but fair to him to lay at length before our readers.

(C.)

BROWN'S GAS VACUUM ENGINE.

In the circular (A) mention is only made of the gas engines, and their manner of working. It may, perhaps, be desirable to say something of the generation of the power used to work them. The science of gas making is still in its infancy, new discoveries are daily made in it, and among them not the least is the fact that one cubic foot of gas will make on an average 40 feet of vacuum, whereas one foot of vacuum to one foot of gas, was the utmost which it had been thought capable of producing Mr. Brown's first attention was given to making the engines perfect; which done, he felt sure of being able to produce gas at so cheap a rate as to enable them to compete with steam. Six years of experiments of the most expensive nature were required for the former purpose, and he has since made several experiments to attain the latter, all of which have been more or less successful. But till within these last few months he had not discovered any, method of making gas, by which it might in most situations, be produced at a positive profit. To produce engines "that will do every thing, and cost nothing," is the perfection of mechanical science. The assertion, that these two objects are now effected by the gas vacuum principle is fully borne out by the results of experiments. The action of the engines will at once convince any one of the truth of the first, but some explanation may be necessary to produce conviction of the second. When gas is made, as in the common way, in retorts heated by furnaces, there must be a loss of fuel from the coal consumed in the latter; but when, according to the system lately adopted by Mr. Brown, the gas retorts are heated by coke ovens, what was the cause of loss becomes an actual source of profit. All the coal is now converted into coke, tar, and gas; the two former of which will, in almost every situation, more than pay the expense of all the coal used. The following account of a series of experiments made with the Croydon gas engine apparatus, under the eye of an eminent engineer, will confirm this assertion:—

26 Bushels small coal, at 22s. per chaldron, wherewith the two ovens were charged twice, produced .. .	35 Bushels best coke, sold at 27s. per chaldron
24 Bushels ditto ditto, wherewith three retorts were charged twice, and the other three retorts three times, produced	36 Bushels retort coke, sold at 22s. per chaldron.
50 Bushels small coal produced...	71 Bushels coke.

From the above results the following calculation was made by the same engineer of the annual cost and profit of the Croydon gas vacuum engine, viz.:

Croydon Gas Engine Account.

Dr.	£	s.	Cr.	£	s.
To 50 bushels small coal, at 22s. per chaldron, for 24 hours, or 417 chaldron for 300 days....	458	14	By 35 bushels best coke from ovens, or 292 chaldron in 300 days, at 26s.	379	12
To one man to attend the engine, 5s. per day, and coals 3s. per week.....	85	16	By 36 bushels coke from retorts, or 300 chaldron in 300 days, at 22s.	330	0
To repairs of machinery, ovens, retorts, &c., 25 per cent. on 300*l.*	75	0	By 16 gallons tar, in 24 hours, 4.800 gallons in 300 days, at 3d.	60	0
To oil for machinery, leather for valves, &c., 2s. per week...	5	4		£769	12
To seven per cent. on value of building	35	0	Deduct Dr. Account.....	666	14
To ground rent of premises....	7	0	To profit and loss per annum	£102	18
	666	14			

This engine, therefore, constitutes a mechanical power in effective and constant action, returning a clear profit of 102*l.* 18*s.* per annum, exclusive of what the work may be worth which that power effects; and for effecting by a steam engine the Canal Company previously paid £275 per annum. The prices of coal and coke must of course vary in different districts; but the above results (which are produced by the prices at Croydon in December, 1831.) will enable every one to calculate what would be the profit and loss on the use of a gas engine in any district with which he may be connected.

It may be desirable here to allude to an

objection made by some persons, that these advantages will not be realized in those districts where there may not be a ready sale for the coke produced; but let it be remembered that fuel is a necessary of life, and if by an abundant supply of one sort of fuel its price should be reduced only five per cent. below another, it would be immediately adopted in preference to it. Coke was a drug every where when gas was first made, and before its good qualities were appreciated; but as they became known the demand for it increased, and its price is now in most places equal to, and in most places higher, than coal. To those, however, who can entertain a doubt on this subject, it may be satisfactory to state, that Mr. Brown has discovered a plan by which gas, fit for the working of his engines, may be produced in large quantities from water by an apparatus of very small dimensions, and consuming a very small quantity of fuel. This method of generating gas will render the invention peculiarly applicable to the propelling of vessels.

It may be remarked also that coal gas is not the only medium by which the gas vacuum engine may be worked. It is not necessary that the gas should be either purified, or fit for the purposes of illumination; any sort of gas which possesses heat and expansiveness will effect the object. A very great sphere of action is thus opened to the invention in those situations where either peat or wood abounds, in as much as bogs may be drained by gas from peat dug on the spot; and as wood gas (of which in the present manufactory of charcoal and pyroligneous acid no use is made) is also equally adapted to the production of vacuum. To those who are acquainted with the very great consumption of the acid in our manufacture this fact will bring conviction, that in many situations an immense profit may be realized by applying the gas thus thrown away to the acquisition of power. The consumption of this acid in Glasgow alone amounts to 10,000 gallons per week, to produce which as much gas is thrown away as would, if used for generating power in the gas vacuum engine, grind corn enough to supply the whole town with flour. To mill machinery, indeed, this invention is peculiarly adapted. It is well known that no power is capable of producing such good flour as that which is supplied by a water-wheel; to raise water for the supply of a water-wheel no power is so well adapted as the gas pillar engine; wherever a tank can be constructed there a water-wheel may be *turned by a pillar engine*, similar to those *at Brompton or Croydon*: there would be *no loss of water*, except what is caused *by evaporation*, which half an hour's daily labour at a single pump would supply, and thus a head of water of any power may be obtained on the very spot where it may be wanted, without being liable to stoppage from drought, flood, or frost, whereas water corn mills are subject to stoppage from all these causes, while their situation, which must depend on the course or fall of a river, is generally most inconvenient, difficult of access, and distant from the residence of the consumers. And when to all this is added the fact, that the power is generated at no expense, and in most cases at a profit, that coke, charcoal, acid, or tar, may be produced for the supply of the neighbourhood; that saw mills may be worked in woods, by gas supplied from the refuse timber and small wood, which are thus converted into a most valuable product; and that the gas apparatus may be placed in any convenient situation, however distant from the engine itself, it must be confessed, that it is difficult to appreciate the value of an invention, a small branch of which produces such extraordinary results.

Since the preceding was in the hands of the printer we have seen the two engines, Nos. 3 and 4, at work on Mr. Brown's premises, Eagle Lodge, Old Brompton. The pillar-engine, No. 3, is similar to the one on the Croydon Canal, but of much greater power, the cylinder being 4 feet 8½ inches in diameter. It gave four and five strokes per minute, and raised in four strokes as much water, from a depth of 12 feet, as filled a tank which we were told had been accurately measured and found to contain 3000 gallons. The average performance, therefore, is 750 gallons, raised 12 feet every stroke = 10-horse power. In this calculation, however, we only give credit for the height between the water and the point of discharge—for there the practical result stops; but to effect this, it is necessary that the water should ascend in the cylinder 6½ feet above the discharge nozzle; so that the entire lift from the bottom is 18½ feet. The engine, No. 4, differs from the others, in being worked like the ordinary steam-engine, by a beam attached at one end to the piston of the gas vacuum apparatus, and at the other to a pump for lifting water. It is particularly adapted to the raising of water from deep mines; and one for this purpose is, we understand, about to be erected in Glamorgaushire. It also worked extremely well. To obtain the gas used in these experiments, we were

informed that three retorts had been charged with six bushels of common coal, and that the produce was as follows: 2100 cubic feet of gas, 9 bushels of retort coke, besides a quantity of tar not measured. We unfortunately, however, omitted to make inquiry respecting the quantity of coal expended in heating the retorts, and shall be glad to receive further information on this head.

ON OILING MACHINERY.

Sir,—There are some remarks in your last number, page 270, taken from the Journal of the Franklin Institute; in which it is stated that oiling of axles continually, so as not to waste a drop of oil, had not been done, till the latest improvement in the friction-saving carriage of the Baltimore Rail-road.

This may be true as regards America; but in England that desirable object has been accomplished some time, by the axles of Mr. Collinge, Mr. Mason, Messrs. Theo. Jones, and some others; in each of which, the continual lubrication of the working parts has been carried to great practical perfection.

With respect to the statements of Mr. M'Ilvaine and George W. Smith, Esq., "that the finest sperm oil most effectually relieves machinery from the effects of friction," I beg leave to add my own humble testimony, as well as the corroborative evidence of several scientific friends, to the correctness of this opinion.

One gentleman, an eminent clockmaker, informs me, that after a series of well-conducted and long-continued experiments, he has arrived at the conclusion, that the finest sperm oil, when purified, is the very best that can be used for all kinds of watch and clock-work; as well as for every other description of well finished machinery, from the smallest lathe to the largest steam-engine.

I must certainly differ from Mr. Rennie, "that the more fluid unguents apply best to light loads." My opinion is, that the finish of the working parts interferes more with the character of the unguent than the mere weight of the load. Thus, for instance, with accurately turned, and highly polished, case-hardened axles and collars—such as those of Messrs. Theo. Jones and Co.—the fluid unguents are the best, whatever may be the weight of the load.

While, on the contrary, axles of less exquisite workmanship, in which the friction is consequently much greater,—such as the axles of ordinary carts and coaches—are best lubricated by an unguent of greater consistency, although the load upon them may be lighter than in the former case.

A very beautiful method of lubricating the axles of fixed machinery was contrived some years ago by Mr. John Barton, and, I believe, included in one of his patents.

It consisted of a tin vessel, as delineated in the prefixed figure, having a tube, *a a*, passing down through it, and a cover to keep out dust, &c. A number of cotton threads were placed with one end down the tube, the other ends laying over the sides, and descending to the bottom of the vessel. The cup being filled with oil to the line *o o*, and the small tube *a* being inserted in the upper gudgeon of the axle, the cotton fibres become a syphon acting by capillary attraction, which slowly and gradually conveys the oil from the vessel down the tube to the axle to be lubricated.

By increasing or diminishing the quantity of cotton, the flow of oil is regulated to suit the consumption of the machine. In the same way, a gradual supply of *water* may be obtained for any required purpose, such as some grinding processes — the nourishment of delicate plants, &c. &c.

I remain, Sir,

Yours, respectfully,

WM. BADDELEY.

July 21, 1832.

THE GRESHAM LECTURES.

Sir,—I am afraid Mr. Baddeley is rather too sanguine in his anticipations (page 267) of a revival of the Gresham Lectures; the present Professors are so obstinately bent on not improving in their own persons, and not allowing others to introduce improvement, that they form almost insurmountable stumbling-blocks in the way of any alteration. A year or two back, the Gresham Committee proposed to remove the lectures to the Theatre of the London Institution, in Finsbury Circus: they applied to the proprietors of that establishment, who actually consented to the measure, and agreed to admit the public generally to the Lecture-room built for themselves, at their own expense: solely, it is to be supposed, from a desire that the noble bequest of Gresham might not any longer remain in its present disgraceful state of decay,—every thing, in short, was settled, and the proposition was expected to be carried immediately into effect, *nemine contradicente*, when the professors entered their caveat against the measure,—and to this day their opposition has been successful! The reason why they did not relish the change is "plain as way to parish church;" in that way, (especially as the Lectures were to be read in the evening) they would, doubtless, have been compelled, by the attendance of an audience *who knew where to find them*, to perform the duties of their situations; and moreover, perhaps, instead of inflicting the remains of antiquity, which it seems they are in the habit of muttering over when they do deliver any thing at all—to produce something more in accordance with the spirit of the age. Their course, therefore, was chalked out for them,—they refused, as it is understood, to budge an inch from the 'room on the south-east side of the Royal Exchange,' hitherto hallowed by their exertions; and, there being no remedy, we suppose, if they choose to continue obstinate, *there* they still hold forth for the enlightenment of this present generation!

A good deal might be done if only three determined "students" were to band together, and regularly attend at the time specified, so as to compel the Professors to do their duty. It appears, from *the very useful and entertaining* lucubrations of the Editor of a publication which appeared periodically in 1825, called "The Circulator" (now extinct) that these "grave and reverend signiors" are actually somewhere within hail of the Royal Exchange,—each, in his turn —every day during Term, but that the door of the lecture-room is opened *precisely* at the hour named in the advertisements, by a very vigilant porter, who, unless *three* persons at least (a legal congregation) rush at once into the "darksome cave," instantly closes it again, and informs the Professor that he will not be troubled for that day! The gentleman in question, resolved to "do the state some service," joined by two stout-hearted friends, actually succeeded in "storming the breach," and had the happiness —(for it is *something*, surely, to hear a Gresham Lecture)—of listening to a grave discourse on Geometry, by "the Rev. Samuel Birch, A. M." The lecture, according to this hardy adventurer's account, gave a tolerably clear view of the science as it existed two or three centuries ago, having, most probably, been written by the original Professor, and left as an heir-loom to his successors. The fact is, that whenever one of the lectureships has been vacant, an Alderman, or some other influential member of the Corporation, has exerted his interest to put one of his family or dependants into the vacant place, which, from time immemorial, has been looked upon as a snug sinecure of a hundred a year:—and this is the reason why the holders of the situation resist any attempt to make them do something, with such rigid pertinacity and such virtuous indignation. The office is on the same footing as the chaplainships to the gaols, or the lectureships of the city churches, considered as "a pretty thing," for the city magnates to bestow on any "parson in the family." No less than five out of the seven present Professors are clergymen.

The idea of removing the lectures to the London Institution (which is on the very verge of the City) does not seem a very good one; neither do I believe that Crosby-Hall would well suit the purpose, although if their removal thither might have any effect in preserving that interesting relic of antiquity, of course every good citizen, and every well-wisher to

the arts, would join heartily in the design:—that object, however, I believe, is likely to be effected without any connection with the present. The best place for the delivery of the Lectures appears to be Guildhall, where there are several rooms well adapted to the purpose, either wholly, or very often unoccupied. Thus, the old Court of King's Bench, since the building of the New Courts, is, I believe, only used now and then,—once in a month or two, to hold the Sessions, and at Lord Mayor's day, as a sort of antechamber; at a little expence this, which is a tolerably spacious room, might be converted into an excellent Theatre, where the citizens might be instructed from what was heretofore the very seat of justice,—a most appropriate destination! The old Common Pleas Court, too, is almost disused, and very easily convertible. But why should not the council-chamber itself be given up for the purpose? The corporation meetings are not numerous enough to require it for more than a tithe of its time, and how could it be better applied during the remainder, than in the diffusion of knowledge; an object which that liberal assembly, the Common Council, professes to have so much at heart? There are suitable places enough, indeed, to be found, if the grand object, that of effecting a removal, improving the lectures, and giving them in the evening, could be effected. As matters stand, they are delivered, or announced to be delivered, at an hour when the city is so full of business, that its inhabitants have neither leisure nor opportunity to attend to "the voice of instruction." They are appointed to be read at twelve o'clock in Latin, and at one in English. As to the Latin part of the business, that might be very advantageously dispensed with; or a compact might be entered into with the Professors, that they should not be troubled on that score, provided their English lectures were a little improved, and regularly delivered. One of the objects of removing to Guildhall in particular, would be to connect the establishment with that of the City Library, which already exists there, but to which, it is feared, the access of the citizens is too much restricted; if the Gresham Lectures were reformed, and the City Library thrown open, as it ought to be, at least to all freemen, and sons, and apprentices of freemen, it would be a glorious consummation, and the City of London would set an example to the rest of the kingdom worthy of the "proud metropolis of commerce." On this head, as well as on the other, much is expected from the exertions of Mr. Richard Taylor, who, as member of the Common Council, and Editor of the Philosophical Magazine, is "twice armed for the fight." We hope he will meet with the support he deserves; and that, if no improvement is to be expected while the present Lecturers hold office, he and his supporters in the Corporation will take care, on any vacancy, that no one shall be appointed unfit for the office, or who will not pledge himself willingly to conform to the spirit of improvement, by shifting the scene of his labours to whatever situation may be deemed most convenient.

For the information of those who may have the power and the inclination to further the cause by attending the lectures, and forcing the *worthy* Professors at least to the formality of discharging their duties,—a course which may do more good than a hundred bare "resolutions," which those respectable gentlemen can anywise evade,—they are "respectfully informed," that the Gresham Theatre is approachable by a staircase under the Cornhill Piazza of the Exchange, near the South gate, and that the hours of delivery are precisely twelve for Latin, and one for English (to a moment) every day during Term-time. The following are the various courses:—

Divinity — Rev. H. Parker, A. M. — Monday.
Civil Law—Rev. W. J. Palmer, A.M.—Tuesday.
Astronomy—Rev. Dr. Sandiford—Wednesday.
Music—Mr. Stevens—Do. (at 2.)
Geometery—Rev. S. Birch, A.M.—Thursday.
Rhetoric—Rev. E. Owen, A.M.—Friday.
Physic—Dr. Stanger—Saturday.

From this it will be seen, that some of the sciences now reckoned the most important, Chemistry and Mechanics for instance, are not included in the arrangement. I make no doubt, however,

that if the projected improvements were carried into effect, a sufficient sum might soon be raised by subscription to fill up the deficiency, and make the course of instruction complete, or perhaps (how knows?) some citizen of the present time might be tempted to follow the laudable example of Gresham, if the real advantage of it were always before his eyes, instead of being assiduously concealed from view.

The best way of managing the Lecturers would be to elect them only for a term, say three years. The emoluments are fully sufficient to procure first-rate professors of each science. A popular evening course, if only for one term, would give such an impulse to the whole, that a thorough improvement could no longer be resisted, and the Augean stable *must* be cleansed. It is to be hoped the Gresham Committee will take the earliest opportunity to put matters in a train for so desirable an event.

With respect to Crosby Hall, there is every reason to believe that a public subscription will rescue it from destruction. It is rather strange that Mr. Baddeley, in enumerating its claims to distinction, forgot its greatest—that it is mentioned by Shakspeare, as the residence of Richard III. That so venerable a relic of antiquity should be destroyed, would be an indelible disgrace to the present race of Londoners.

Yours, &c.

F. H.

July 21st, 1832.

MR. LOUDON'S ENCYCLOPÆDIA OF COTTAGE, FARM, AND VILLA ARCHITECTURE. PART II.

We take a great deal of interest in the success of this work—considering it to be calculated, beyond most undertakings of the day, to add to the comforts of the middling and lower classes of our countrymen—and are, therefore, glad to find that it not only continues to answer all the expectations we had formed of it, but that such a reduction has taken place in its price as must at least double its chances of being read, and, of course, of doing good. Part II. is occupied, like *Part I., with designs* for cottage dwellings—*of which 32* in all have now been published—all exhibiting some variety or other of style, and all, more or less, adapted to particular localities and circumstances. These "Designs," too, consist not of external elevations merely, but include plans, sections, specifications, estimates—every thing, in short, necessary to enable a builder to go to work upon them immediately. Such a treasury of models and practical details must, to all who have any thing to do with house or cottage building, be invaluable. Another excellent feature of the work (not noticed by us before), is the great quantity of useful information and judicious advice on subordinate matters of taste and economy which the author has interspersed. In Part I., for example, we had plans of ovens, filters, pumps, water-closets, hinges, sashes, &c.; and in Part II. we have designs for staircases, parapets, railings, verandas, flower-boxes, &c. But perhaps the best way to show the value of the work in this respect will be to give a few specimens from the Part before us.

How to Save Room in Staircases.—Treating of the alterations and improvements of which Design XVIII ("A Dwelling for a Man and his Wife without Children") is susceptible, Mr. Loudon remarks:—

"The greatest improvement, however, of which a cottage such as Design XVIII. is susceptible, is by adding another story to it. This may be done in various ways; the cheapest would be by turning the two small closets into one economical staircase, of the kind shown in fig. 137.

Fig. 137.

This description of staircase occupies exactly one-half the space of a staircase on the ordinary plan. This may be easily conceived, when it is observed that every step rises twice the usual height. The space occupied by these two closets is 4

feet by 3 feet 6 inches; and supposing the tread or width of each step of the stair to be 8 inches, and the rise 8 inches, then the depth of the closet being 8 feet, it will admit of carrying the stair 8 feet high. After this the stair may project into the kitchen till it gives the height of the surface of the bed-room floor. The height is exactly 11 feet 6 inches from the surface of the ground-floor, none of our ceilings being lower than 10 feet. If the projection of the top of the stair into the kitchen were an insuperable objection, then the bottom might either project two double steps into the bed room below, the door shutting against the riser (perpendicular board) of the third step; or a trap-stair, composed of the two lower steps, and made to fold up, might be resorted to. This practice is to be met with in France, and it is remarkable that the celebrated Jefferson, when making a tour in that country, was so struck with the contrivance, that he made a note of it in his journal, which has since been published in his Correspondence.

Garden-hedges.—"The boundary fence (Design XVII.) is a hedge, which in suitable climates may be formed of figs; in more northern latitudes, of apples, quinces, or plums; and in cold, exposed situations, of sloes, elders, services, or mountain-ash. The fruits of the sloe and the berries of the elder are valuable for wine, and those of the service and mountain-ash afford an excellent spirit. The three last-named trees must never be clipped, otherwise they will produce but few blossoms. Whenever a cottager has the power of choosing the sort of hedge which shall surround his garden, he may in all cases, if he chooses, render it productive of useful fruit; for every climate has its fruit-shrubs and its low, edible, fruit-bearing trees. It must always be recollected, that the ground inside of the fence being under garden cultivation, and well manured, it would be a pity to let any part of this enriched soil be exhausted by barren trees or shrubs. Even when a powerful fence is required, by planting a double row of hedge-plants, the outer ones of thorns, and the inner ones of fruit-shrubs, the riches of the soil will not be altogether lost.

Parapets.—"The Italian parapet is formed of tiles of any kind, but not longer than 6 or 8 inches, piled up between piers, as in figures 147, 148, 149, 150, 151, 152.

Fig. 147.

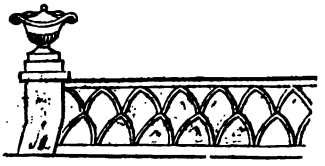


Fig. 148.

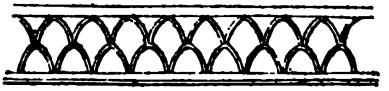


Fig. 149.

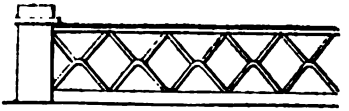


Fig. 150.

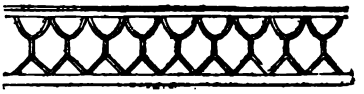
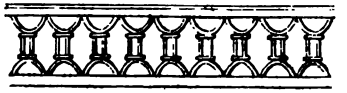


Fig. 151.

Fig. 152.



It is easy to conceive that numerous other variations of the same kind may be made in the same manner by tiles of these, and of other kinds, with or without the aid of bricks and paving-tiles. A very handsome parapet may be made by using small hollow draining-tiles or tubes as balusters. To the Indian cottage (fig. 145) parapets may be contrived of appropriate Indian forms (fig. 153 and 154.)

Fig. 153.

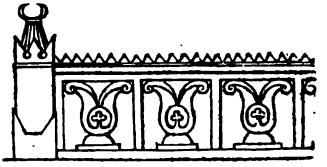
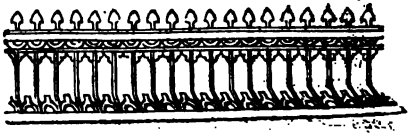


Fig. 154.



Vases for Parapets.—"We have shown in fig. 109, three descriptions of terrace-parapets, with three styles of ornamental vases. The vases for the original cottage (a plain dwelling for a mechanic, and his wife, without children), may be stone pots in shape not materially different from the common flower-pot; those for the first addition (a dining-room to suit the mechanic, when increase of substance has brought with it increase of friends), may be as in fig. 110, manufactured by Mr. Peake, of Tunstall, in Staffordshire, and sold at 15*s.* each;

Fig. 110.

and those for the second addition (a drawing-room and two spare bed-rooms), may be a tazzo (cup) vase, like fig. 111, manufactured by the same potter, at 18*s.*

Fig. 111.

The Honeysuckle Taste.—"The practice of almost entirely covering buildings in the country with creepers, can by no means be considered as in good taste; a few may be trained up a plain building or a ruin; but to cover a handsome piece of architecture in this way, is to defeat the very intention for which that architecture was produced. In the country all is vegetation; what beauty, therefore, can be expected from clothing with foliage an object which to produce any effect at all must operate by contrast? In the town all is architecture, and there the introduction of vegetation of any kind in a building can in point of effect hardly be carried too far. In the country the white or grey walls of the plainest cottage are a relief to the eye from the eternal monotony of green by which such cottages are generally surrounded. In addition to this it *should never be forgotten*, that all vegetation *near a house*, especially that of deciduous plants, encourages damp and insects.

Mignionette Troughs.—"A very suitable parapet for the terrace of this cottage (Design XXIX.) might be formed by placing mignionette troughs of Austin's artificial stone, or of Peake's Staffordshire ware, such as fig. 198, on the top of a 4-inch brick-wall, formed of open or pigeon-hole brick-work, and carried to the height of 18 or 20 inches. At the corner of this wall solid square piers might be built, covered with plaster, and pannelled like the pilasters at the end of the house, and these might be terminated by square mignionette-boxes, fig. 199.*

Fig. 199.

This done, and corresponding terminations given to the chimneys, the design may then be considered as tolerably complete. The mignionette-boxes, for mere admirers of flowers and lovers of sweet smells, may be filled with earth, and sown or planted with mignionette; but for botanical amateurs they may be filled with alpines or herbaceous plants in small pots. To a botanist, even if he had no other resource than the native plants of Britain, this would afford a perpetual source of enjoyment, because the length of the four sides of the parapet being 160 feet, the oblong and square troughs would contain 680 pots of 3 inches in diameter, and, of course, as many species. These might be changed, arranged, and re-arranged, at pleasure.

French Window and Hinge.—"The windows (Design XXIV.) are in the French manner, that is, opening in the middle from top to bottom; and to render the junction as much as possible air-tight, the styles, fig. 177, half the full size, are made

Fig. 177.

* We insert this fig. only. Fig. 198 is precisely the same; only that it is of an oblong, instead of a square form.—Ed. M. M.

to fit into each other in the manner shown at E.

"*Architectural Drawing friendly to Morals.*—We recommend to our readers to attempt to realize these improvements on paper. The benefits they will derive from so doing is far greater than may at first sight appear. The mere circumstance of familiarizing the mind with orderly arrangement, regular figures, symmetry, means adapted to the end in view, either in buildings, in furniture, or in gardens, must have an influence on conduct. Order is the undamental principle of all morals; for what is immorality but a disturbance of the order of civilized society, a disturbance of the relations between man and man? We do not say that all kinds of drawing have a tendency to produce an orderly mind; but we do affirm, that architectural drawing has that tendency in an eminent degree. Carpenters and stonemasons are a superior class of mechanics in all countries."

The reader will be satisfied from these extracts that we have not exaggerated the strength of the under-current of information (if we may so speak) which runs through every page of this very excellent work. Mr. Loudon's notions are distinguished at times by a certain degree of eccentricity, but it is more in the manner than the matter; for, generally speaking, we could not wish gentlemen improvers a sounder adviser, nor architects, builders, and surveyors—of every degree—a more judicious critic and guide.

AN ACCOUNT OF THE IMPORTANT AND SUCCESSFUL RESULTS OF EXPERIMENTAL TRIALS IN DEMERARA, TO OBTAIN NATIVE RAW SUGAR FROM THE CANE-JUICE, BY AN IMPROVED OPERATION OF EVAPORATION IN VACUO. BY MR. ABRAHAM BOOTH, EXPERIMENTAL CHEMIST, AND LECTURER ON CHEMISTRY AND NATURAL PHILOSOPHY.

When England, by her maritime superiority, had obtained the whole of the continental West Indian possessions, a stimulus was given to the trade in sugar, which rendered the merchants who were engaged in it, distinguished for their wealth and respectability. Many causes have, however, recently operated in producing a depreciation in the value of this species of property; estates, the profits of which formerly produced annual fortunes, now encumbered by heavy mortgages, are a burden to the proprietors; and the colonies themselves, instead of proving a benefit, are actually a drawback to the mother country. No one connected with the history of our colonial possessions can doubt but that one great cause of this depression is in the inadequate return afforded for a most extensive outlay. When England possessed an almost exclusive monopoly of the supply of sugar to the whole world, plantations formed a very profitable channel for the employment of capital; extensive establishments were formed, and the whole of the land capable of growing sugar-cane was put into active cultivation; but the return of peace, and the surrender of a large portion of the colonial conquests, gave the first shock to our West Indian interests, the effects of which have since been so largely and sensibly felt.

Planters, and West Indian proprietors, appear to have been aware, that any legislative privilege which the Government of the mother country could afford would be inefficient unless it was seconded by their local exertions. The method, by which so large a quantity of deteriorated material as they were in the habit of procuring, in the shape of *uncrystallizable sugar*, or *molasses*, might be saved, suggested itself as a valuable consideration. The important advantages which might be anticipated, were this object effected—in a more adequate return from the plantations, and in a necessity for employing so large a number of hands—gave a stimulus to every research. It has thus ever afforded a source of speculative enterprise to industrious schemers, who have always found a market for their projects, however preposterous or visionary. The evaporation of the cane-juice in vacuo, at the last stage of concentration, was proposed, not for the purpose of improving the molasses, but to prevent their formation, and thus it differed in its objects from the various schemes which had often been proposed. So often, however, had the planters been injured, and not unfrequently ruined by following the various specious plans which had been imposed upon them, that at its first introduction this process had to combat with all the obstacles which the failure of others had raised up against it. It has, however, already made such progress, that by the most competent judges it is consi-

dered to have opened a new era in the history of the colonies; as likely to revive the spoiled fortunes of the planters, and render these possessions a service of benefit, instead of an obstacle to the prosperity of the mother country. It may be noticed as somewhat extraordinary, that at the period when the apparatus was first sent to the colonies, some French adventurers were at Demerara, with a process, for divulging which they required the sum of *ten thousand pounds*, and that the question was then in discussion before the Board of Commerce. The important results of the present improved process, had, however, the effect to put a stop to these negotiations, and if the present is not the perfection of the manufacture, it will at least be long before the colonies can boast such an important improvement in their staple commodity and support.

For the introduction of this valuable process, we are solely indebted to the indefatigable exertions of Mr. William Oaks, of Houndsditch; who, after long experience in the manufacture of the apparatus, struggling for a considerable time against those obstacles which naturally impede the introduction of every new invention or application, at last succeeded in gaining the co-operation of an extensive West Indian proprietor at Liverpool, whose attorney on the estate gave every possible facility; it may be considered fortunate, that the attempt met with such valuable co-operation. Thanks are also due to Mr. Thomas Dodson, for his determined perseverance in the erection and completion of the apparatus, and to Mr. Jacob Benson, an English boiler, who has shown considerable practical knowledge, and to whom belongs the credit of being the first to boil the cane-juice in vacuo, and produce these desirable results.

I shall offer no further comment before introducing the following able and judicious letter, extracted from the *Guiana Chronicle*, in which are developed the views which led to the introduction of the process, and also the complete success attendant upon the first trials.

From the Guiana Chronicle and Demerara Gazette.

TO THE PLANTERS OF DEMERARA AND ESSEQUIBO.

Gentlemen,

The attention which has latterly *been excited by* the various attempts to improve the manufacture of the staple produce of the colony, whilst it evinces your sense of the importance of the object, and implies a conviction on your part that the manufacture of sugar is susceptible of improvement, also encourages a hope that any communication, which may have for its object the accomplishment of so desirable an end, and one so intimately connected with your interests, will, in its turn, meet with its due share of attention.

The respective merits of the several systems which have from time to time been proposed for your adoption, have not only been the subject of much private discussion, but have given rise to some animated discusion in the public prints—in the course of which, allusions have been made to the principle of boiling in vacuo.

Several months have elapsed since my arrival in this colony for the express purpose of introducing this scientific system, which, though till now never applied to the original practice of manufacturing sugar from the cane, has, by the advantages resulting from its adoption by the principal refiners in Great Britain, during twenty years practical operation, acquired the highest reputation. It is the fruit of many scientific experiments and much indefatigable perseverance of a late very eminent chemist; and has received the unqualified approbation of the most eminent of that profession, amongst whom are to be found the names of Sir Humphrey Davy, Drs. Ure, Trail, &c.

Although a long acquaintance with the properties of the vacuum pan, might have warranted me in soliciting your attention thereto at an earlier period, I considered it not only more respectful to you, but also much more in accordance with the diffidence, which as a stranger to the profession of a planter, I ought to feel to abstain from so doing, until the applicability of the apparatus to colonial purposes was placed beyond dispute — in other words, until I had completed the erection of an apparatus in the colony. I considered also that by postponing it until then, the subject would be divested of that speculative character, which is always more or less attached to new applications; and that instead of having to meet objections, which no doubt would have been raised against the system, whilst its advantages were problematical, I should, upon the successful result of the experiment then making, be enabled to adduce actual results instead of plausible conclusions, and facts instead of reasonings.

The experiment has now been tried, and its effects are equal to our most san-

guine expectations. The apparatus has been some weeks in full operation on one of the largest estates in this colony; and its results enable me to offer it to the notice of the sugar planter, as the means of making a superior article, and in a much greater quantity than can be produced by any other process hitherto discovered.

Although it would exceed the limits of this address, to give a detailed description of our apparatus and the process, it may be expected that I should give an outline, and by a few general remarks on the principles upon which this system is founded, point out the connection between the effects and their causes. It is somewhat remarkable that whilst almost every branch of manufacture has been improved by the advance of science and general diffusion of scientific knowledge, and its application to practical purposes, that the art of manufacturing sugar should have remained stationary from the time that Bryan Edwards described that process in his History of the West Indies, and that it should be reserved to the planter of the present day to make the attempt to verify his predictions, when he said, "That it was no extravagant hope, that the time would come when the salt of the cane, or what we call sugar, would be made pure, and strike into transparent crystals."

The concentration of the cane-juice on the present mode of making sugar in the boilers, requires a long exposure to the action of the fire, the temperature increasing as the operation advances, until it has acquired its proper grain and consistence, when it may be quoted at 250°.

The length of time required to complete the process varies according to circumstances, and depends much upon the skill with which the boilers are hung, the state of the megass, and the consequent intensity of the heat, &c.

Practical chemists well know how injurious so high a temperature is to the flavour and colour of any delicate extract, its tendency to carbonise being in proportion to its consistence; a desire to counteract which, led to the invention of the vacuum-pan by the late Hon. Edward Charles Howard, and its application on an extensive scale to the refining of sugar.

The vacuum-pan is a large, strong, copper vessel; its form is elegant and scientific; its parts are manufactured and fitted with so much care and exactness as to exclude the admission of all external air. It is worked by the agency of steam, applied externally between the lower part of the pan, and an outside casing. An air-pump, worked by and attached to the steam-engine, is connected by pipes to the upper part of the pan.

The pressure of the atmospheric air on the surface of sugar, or any other liquid, boiling in an open vessel, counteracts the ebullition, and by thus retarding the evaporation, renders either an excessive heat, or a longer exposure to one less intense, unavoidable. The common culinary operations of the kitchen afford us daily proofs of the effects of fire upon animal and vegetable substances, and their tendency to carbonise. Milk, for instance, exposed to a fierce fire, not only contracts colour and a disagreeable taste, but forms a black and adhesive crust on the bottom of the vessel. Meat, fish, eggs, &c., possess this tendency in a greater or less degree; a certain portion of this substance is either entirely destroyed, or undergoes a chemical change, which leaves it little or no identity to the original mass of which it formed a component part.

In the manufacture of sugar in the teache, the destructive effects of excessive heat obtain to an effect beyond what may generally be suspected. It destroys a great proportion of the crystals, or, what is the same, it converts the syrup, which would otherwise crystallize, into molasses, by which the quantity of sugar is very materially diminished, and by the creation of carbon, or colouring matter, deteriorates its quality. By this twofold disadvantage the planter is subjected to a great loss, from which he now possesses the opportunity of relieving himself by the adoption of this system.

The excellence of the principle of boiling in vacuo consists in the exclusion of the atmospheric air, and the consequent removal of its pressure; of being able to perform that operation at from 90° to 100 less heat than is required in an open vessel, at which temperature it cannot possibly sustain any injury in its crystals or colour.

The crystals or grain of the sugar thus manufactured are very large and brilliant. These characteristics give to it a greater superiority over sugar made on the present system. It is also semi-transparent: this proves its purity or freedom from molasses. The size of the crystals involves a very important consideration as connected with the interests of the planter. It is, I believe, a truth susceptible of mathematical demonstration, that in proportion to the increased size of the grain is the increased weight of the sugar. A piece of candy, when broken to pieces, or in other ways disintegrated, cannot be made to occupy as small a space as before. The greater the number of the fractures, the greater

is the number of interstices between them, and consequently the greater room required for their reception; from which it is clear, that any measure of capacity which contains the least divisions of matter, will contain the greatest quantity of weight.

A gallon of sugar of a large grain, and perfectly cured, will outweigh a gallon of sugar equally well cured of small grain. By actual experiments on sugar, made on one estate, four gallons of sugar made in the teache weighed 24lbs.; four gallons made in the vacuum pan weighed 32lbs.; giving as the result the difference of 8lbs., or 2lbs. to the gallon, a difference much greater than was anticipated.

The clearing of the liquor from its impurities, previous to being boiled, has been a desideratum in the manufacture of sugar, and many attempts have been made to accomplish so desirable an object, but without success. This operation forms one part of our system, and to which we owe in part the production of so clear a crystal, by attention to the proper consistence, temperature, and previous preparation of the liquor. We have suceeeded in this very important department by filtering.

Our system of potting and curing is marked by several important deviations from the usual mode, into which it is not my intention to enter beyond making a few general remarks.

I have before observed that sugar made on this principle exceeds in quantity or weight the sugar made in open vessels (as appeared by experiment) in the proportion of 32lbs. to 24lbs., is an increase of 25 per cent. which I endeavoured to shew was attributable to the size of the crystals, which result corroborates the truth of another observation, viz., that a great proportion of *syrups is converted into molasses by excessive heat.* Now this excess not being required in vacuo, the production of molasses is limited to the proportion which nature has given in the cane, a though I am not prepared to state with the confidence and precision which I could wish, what that proportion may bear to the whole saccharine substance; yet it is evident from these data that the operation of curing must be necessarily diminished or assisted in the ratio of the diminished quantity of molasses it is intended to separate. I have also observed that *carbon* or *colour* is another effect of the same cause; which being obviated in the improved plan of boiling in vacuo, there exists no necessity to have recourse to those powerful chemical menstrua, which were only calculated *to repair an injury sustained* in the original process at the expense of quantity. As this injury is proved not to take place in the vacuum pan, the sugar stands in no need of any artificial expedients of this nature.

Having in the course of this letter felt myself warranted in offering the vacuum pan and accompanying apparatus to the notice of Gentlemen connected with sugar estates, and endeavoured to shew by actual results that the advantages of this system are not chimerical, and by a very imperfect and superficial explanation of the principles which govern its operations, having attempted to convey some general idea of its characteristic features, it only remains for me to inform those gentlemen who may be desirous of further satisfaction on any points connected therewith, with a view of availing themselves of its advantages, that as the agent of Messrs. W. Oaks and Son, of London, I shall be happy to afford any additional information.

I am, gentlemen,

Yours very respectfully,

THOMAS DODSON,

Pl. Vreede en Hopp, Demerara, 1st Feb. 1837.

The Editor of the *Guiana Chronicle* notices the foregoing communication in the following remarks:—

"We refer to an article on sugar boiling, which we this day insert. We leave it to experienced planters to decide on the practical advantages of the plan. We always avail ourselves with pleasure of every opportunity of submitting to their judgment any proposed improvement in a process of such vital importance to the interests of the Colonies, where such proposals bear the appearance of being the offspring of science, experience, and practicability."

From the samples which I have seen prepared upon different estates, I have no hesitation in stating, that the great desideratum since the cane has been cultivated has now been accomplished—*the preparation of pure sugar direct from the cane juice.* The sugar is obtained in granular crystals, of four and six-sided prisms, terminated by two and three-sided summits, and they are perfectly transparent. It has a very rich mellifluous taste, unknown to that prepared by any other process; it is a purer sweet than even the best refined, and is in no danger of turning into acid in solution, as are other refined sugars.

On the plantations, where this mode of operation has been introduced, it is

proved that an addition of 25 per cent. in quantity is obtained; an addition of from 10*s.* to 12*s.* in price per cwt., has been already received for a considerable quantity which has been introduced into the Liverpool market. The apparatus possesses the power to make double the quantity of sugar in the same space of time as the old method.

The advantages of the present improved process consists principally in effecting the last stages of concentration of the juice at so low a temperature as shall merely evaporate the aqueous part without decomposing any portion of the rest. This method of concentration has for twenty-one years been in successful operation in the principal sugar refineries of Great Britain.

The process of the operation is as follows:—the canes are crushed, and the juice is concentrated in the usual way, and all extraneous matters are removed by skimming, &c., until the liquor is of nearly equal gravity, water and saccharine, which is proved by the saccharometer. It is then received into a cistern, from whence it is admitted into a vessel closed against the atmosphere, called a vacuum pan, and having a double bottom, in which steam circulates, whilst the upper part communicates with an air pump, which maintaining a partial vacuum, causes the sugar to boil rapidly at a temperature incapable of decomposing any part of it, or of effecting any changes in its chemical composition.

When sufficiently concentrated, the sugar is discharged into a receiver, called the heater, which is surrounded by steam. Here it is again heated for a short time to strengthen the granulation; and it is then put into very shallow vessels to drain off any small portion of uncrystallizable syrup which may adhere to the crystals. When drained, it is placed in trays, and dried in the sun, or removed to the drying house, which, if heated by steam pipes, the same raw sugar can be pressed direct from the curing pans into the stamped loaves, which there is no doubt will soon form a very available and efficient artrcle of commerce.

It may be added, that while there is no apparatus to compete with the vacuum principle, there is none so suitable to be put into action, in all climates where the cane is reared, with such beneficial advantages *in profit or durability. Its application is particularly adapted* for the Mauritius, East Indian, and all foreign sugars, as it possesses a superior advantage in protecting all delicate qualities from decomposition.

On some early occasion I may again trouble your readers with some further observations upon the successive developements and application of the advantages of this system. In the mean time I may mention that samples of the sugar may be seen at the counting-house of Messrs. Oaks and Son, 97, Houndsditch, who will communicate any further information upon the subject to any of your readers interested in the inquir

London, July 14, 1832.

[The sample of sugar which Mr. Booth has been so good as to send with the preceding very valuable communication, fully bears him out in every thing he has said in its favour. It is left at our office, and may be seen there by any person desirous of examining it—Ed. M. M.]

Vocal Clock.—"On Monday, April 27, 1762," says Wesley in his Journal, "being at Lurgan, in Ireland, I embraced the opportunity which I had long desired, of talking with Mr. Miller, the contriver of that statue, which was in Lurgan when I was there before. It was the figure of an old man standing in a case, with a curtain drawn before him, over against a clock, which stood on the oppo-ite side of the room. Every time the clock struck he opened the door with one hand, drew back the curtain with the other, turned his head, as if looking round on the company, and then said with a clear, loud, articulate voice, "past one," or "two," or "three," and so on. But so many came to see this (the like of which all allowed was not to be seen in Europe), that Mr. Miller was in danger of being ruined, not having time to attend to his own business. So as none offered to purchase it, or reward him for his pains, he took the whole machine to pieces."

Naval Gunnery.—Lieutenant Cook, R. N. of Blackheath, (well known as the inventor of the night life-buoy), has recently submitted an invention to the Commissioners of the Admiralty for giving experience to seamen in the art of sea-gunnery, on shore, or on board any ship that may be set apart for the purpose, by means of a platform so constructed that it correctly gives the variety of motions of a vessel when tossed about at sea. It is contrived with much simplicity, yet so as to give the rolling or pitching motion, either separately or together, and to any degree. The platform being fixed in a favourable position for practice near the water, is set in motion, by which the muzzle of the gun upon it crosses and recrosses the target at any given rate; when the gunner by pulling the trigger stops the machine at his pleasure, and it is immediately ascertained whether he would have hit the object had the gun been shotted. Thus by this economical practice, a highly desirable degree of experience may be attained by the crews, while the ships are inactive in port.—*Hampshire Telegraph.*

Caution to Salad Eaters.—No person would suppose that caterpillars, which feed upon vegetable substances, could be found alive in the stomach. But a case is recorded in the Philosophical Transactions, by Lister, of a boy who vomited several. It is supposed that the eggs were swallowed with a salad, and that enough of the vegetable remained to support them when hatched.

WAREHOUSING CORN.

A subscriber and reader of that interesting work the Mechanics' Magazine would be obliged by the insertion of the following question:—What would be the best manner of constructing and erecting a machine in a corn stores, for raising bags of corn from 240lbs. to 300lbs. each by manual labour, in the shortest time and with the quickest dispatch possible? The stores are about 60 feet high.

Youghal, (7th month) 1832.

Sleeping at Lectures.—Sir, I must beg leave to trouble you on a subject, which, though rather of a selfish nature, is one in which many, besides the writer are interested. You must know, I work hard generally all day without my mind having scarcely any thing to do. Now, my judgement tells me, if you dont give the head something to do the contents will never be worth much, and when old age comes on you will have sore cause to repent not having laid in during the prime of life a sufficient store of knowledge wherewsth to solace your declining years. This being the case, I feel it a duty to attend upon Theological and Scientific Lectures; but the difficulty that I want you to extricate me from is this. Often during the most interesting lecture I fall asleep, and I find that I am by no means singular in this respect. Now, if I may speak for others as well as myself, we should ever feel grateful if you or any of your readers could tell us of any chemical preparation that might be applied to the nostrils, so as to relieve the brain of its drowsiness. It appears to me not unreasonable to think that nature supplies something that would have that effect for an hour or so, without much hurting the constitution.—I am, &c., S. P., a Brass Turner.

[We think our friend mistakes the case, and of course the remedy that is required. Does he ever sleep at a play? We suspect not. We have witnessed much slumbering in churches and lecture-rooms; we know even of a learned Bishop, who, though "a hard day's work" is to him a thing unknown, never attends a meeting of the Royal Society but to take a sound nap, and who once actually fell from his chair during the reading of one of Sir Everard Home's most delicate and curious disquisitions; but we have rarely seen any thing of the kind at a theatre, and never at all among the gods, that is, among the "hard-day's work" men. What is wanted in lecture rooms—and, of a truth, it is *much* wanted—is not any "chemical preparation" to tickle the nostrils of the hearers, but ability to fix their attention. We have many well-informed lecturers; but very few popular ones. Nor will the case probably be otherwise as long as gratuitous lecturing is so much the fashion (opening, as it does, so wide a door to ignorance and conceit), and hired lecturing so wretchedly rewarded. Make lecturing a business worth following, and you will have lecturers whom no one can help listening to, as certainly as you have your Keans, and Kembles, and Listons.—Ed. M. M.]

Dr. Henry's Disinfecting Process.—An apparatus for the disinfection of clothes, bedding, &c., on the plan proposed by Dr. Henry, (see Mech. Mag. vol. xvi. p. 98), has been erected at Lancaster Castle (at an expense of only £10); and another is also about to be put up at the New Bailey, Manchester. The apparatus consists simply of two cast-iron pans —the inner one 3 feet 6 inches diameter, and 2 feet 2 inches deep; the outer one 3 feet 8 inches diameter, and 2 feet 4 inches deep. They are united at the flanches. The shape, however, is of no consequence, provided the clothes are only sufficiently heated. Neither has steam any advantages over hot air, except in so far as it may secure linen or *woollen articles from being* burned. A hot closet, *so constructed as that the* heat should not rise above *from 212 to 220 degrees,* would doubtless answer the *purpose.*

LIST OF NEW PATENTS GRANTED FROM THE 20TH OF JUNE TO THE 20TH OF JULY, 1832.

Edward Garsed, of Homerton, Middlesex, gentleman, and Alfred Robinson, of Mile End, in the said county, merchant, for certain improvements in apparatus for heating, warming, and ventilating drying houses, rooms, buildings, ships, and mines. Six months, June 22.

Harriet Grant Gillet, of Birmingham, in the county of Warwick, widow of the late Augustus Whiting Gillet, of the same place, merchant, for an invention of a new or improved machine or instrument to measure, beat, and give the accents in all the different modes of time with any degree of velocity required, applicable to the teaching of music. Communicated by a foreigner residing abroad. Six months, June 28.

Frederick William Isaac, of Charlotte-street, Fitzroy-square, ivory tortoise shell and pearl-worker, for certain improvements in ornamenting the finger-keys and other parts of pianofortes, organs, and other musical instruments. Six months, June 28.

James Macdonald, of the University Club House, Pall Mall East, Middlesex, gentleman, for an invention of an improved construction of railways. Communicated by a foreigner residing abroad. Six months, June 29.

Alexander Beattie Shankland, of Liverpool-street, London, Esq., for a new method of spinning wool. Communicated by a foreigner residing abroad. Two months, July 5.

William Daubney Holmes, of No 55, St. John-square, Middlesex, engineer, for a new method of heating houses and other buildings, and of applying heat to various manufactures and other purposes. Six months, July 19.

Thomas and Robert Wedlake, of Hornchurch, Middlesex, agricultural instrument makers, for improvements in ploughs, particularly the shares applicable to the same and other ploughs. Two months, July 19.

Robert Hicks, of Wimpole-street, Middlesex, Esq., for an improved method of an apparatus for baking bread. Six months, July 19.

William Hodge, of Margaret-place, Dover-road, Surrey, hat dyer, for certain improvements in apparatus for dyeing hats. Six months, July 19.

INTERIM NOTICES.

We shall endeavour to give Mr. Saul's answer to our American friend next week.

T. T. C. must begin with geometry and mechanical drawing; then study mechanics, mineralogy, and chemistry; and when he is master of all these, he may think of setting up for engineer. The time required will depend altogether on the degree of talent possessed by the student.

The M. P. who says he voted against the Birmingham Railway Bill, in consequence of the statements in Mr. Gordon's book, must be a great simpleton. At all events, his vote did no harm; it was by the Lords the Bill was thrown out. We hope the promoters of the measure will keep in mind, that the Liverpool and Manchester Railway Bill was also defeated in the first instance, and be encouraged by the success which attended a second application, in that instance, to try again. We shall take an early opportunity of entering at large into the subject.

Communications received from An Epsomite—An Old Subscriber—Tempora—Mr. Grellet—A Young Plymouthian—H. G.—R.—W. R. C.

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No. 469.] SATURDAY, AUGUST 4, 1832. [Price 3d.

DESIGN FOR HEATING A DWELLING-HOUSE AND HOT-HOUSE BY MEANS OF ONE FIRE.

Fig. 1.

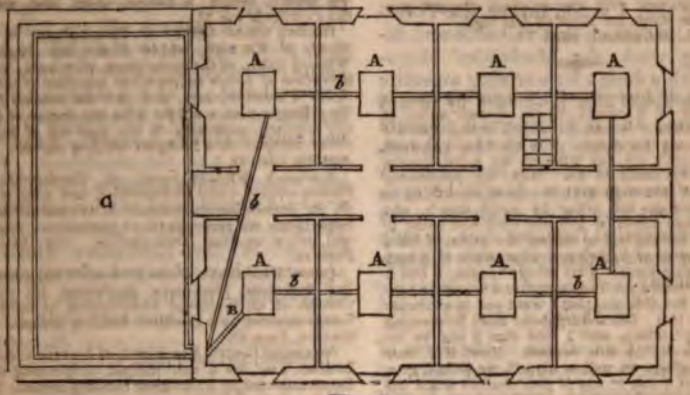
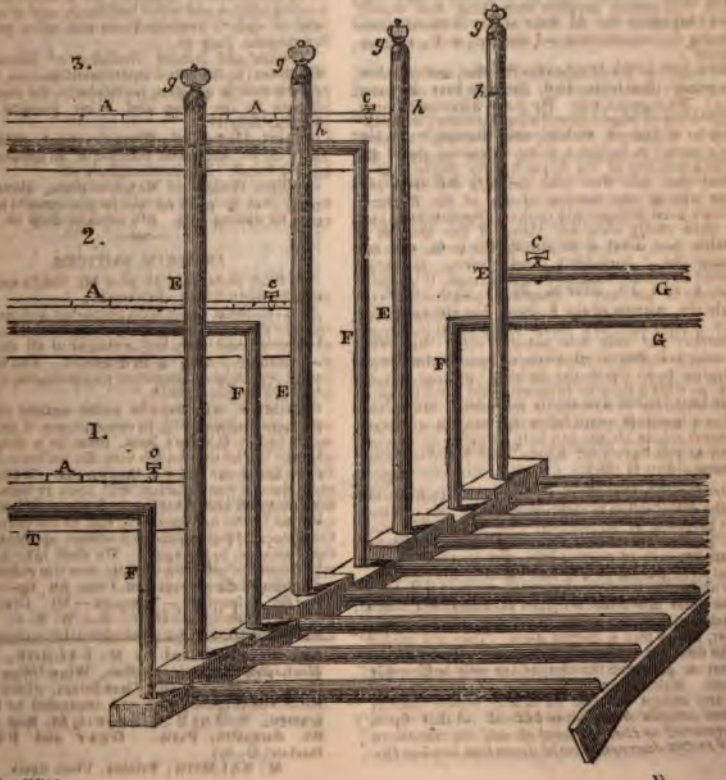


Fig. 2.



DESIGN FOR HEATING A DWELLING-HOUSE AND HOT-HOUSE BY MEANS OF ONE FIRE.

Dear Sir,—I have received a letter from a North American gentleman, requesting that I would favour the Transatlantic readers of that valuable and interesting work, the Mechanics' Magazine, with a design for warming an entire dwelling-house and hot-house by means of one fire; and it is with great pleasure I sit down to comply with the request. My correspondent requires, be it observed, that the arrangements should be such that the heat may be let on either to the whole premises at the same time, or only to one or more of the floors, or to the hot-house merely.

Design.

Fig. 1 is a plan of one of the floors of the dwelling-house; the other will, of course, be precisely similar. AA, are chambers in the floor of each room for the reception of the hot water; say two feet square and three quarters of an inch deep. I have placed them in the centre, that the heat may be more equally dispersed through the room; but I need scarcely say that this is not essential. The water is conveyed throughout the series of chambers by the piping *bb*, which may be about three quarters of an inch in diameter (inside).

Fig. 2 shows in elevation the hot-water tubing. The fire-place and other appendages should be on the same plan as given in Mech. Mag. No. 458, to which, therefore, I beg leave to refer, with this remark only, that in the present design I suppose the fire-place to be in the cellar. I propose that there should be two tubes for each of the floors, Nos. 1, 2, and 3, and two for the hot-house. EE, are the pipes up which the heated particles of water (from their lesser specific gravity) will ascend, and FF, the pipes by which the water, as it becomes cooled and displaced, will return to the boiler. The pipes, EE, must all go a foot or two above the highest floors, so as to leave a space from *g* to *h* for the play of the water, as explained in Mech. Mag. No. 458; and they should be closed at top with caps made to screw off. GG, are pipes leading to the hot-house. On *each ingress-pipe* there is a tap c, by turning which the circulation of the heated particles will be stopped, so far as regards that portion of the premises to which the pipe leads.

It may be seen by reference to that excellent work, the Gardeners' Magazine, vol. v. p. 544, and vol. viii. pp. 236--294, that plans similar to the present have been successfully adopted for heating conservatories. Why not, therefore, dwelling-houses as well? The design which I now submit differs, however, in some respects, from any yet published. With best wishes for the progress of the useful arts in America, and my hearty congratulations to you on the extensive circulation which the Mechanics' Magazine appears to have obtained abroad as well as at home, I remain, dear Sir,

Yours very truly,

M. SAUL.

Lancaster, 21st July, 1832.

CHURCH PEWS.

Sir, — I am obliged to your correspondent "Trebor Valentine," for his attention; and I am glad to find that he considers some improvement in church pews to be necessary (vol. xvii. p. 183), although he does not agree with my suggestions for that purpose (vol. xvi. p. 425). I freely admit that the back of the seat, as represented in my section, is too high; and I can assure your readers that the perpendicular part was intended to have been 8 inches, instead of 14; which error I take the opportunity of correcting. The other objection, however, which your indefatigable correspondent considers will operate against the adoption of my plan —namely, the additional expence, the increase of room, and its liability to diminish clergymen's fees—ought not to be objections, and they are not of a nature to stand the test of time. On the supposition that my plan is an improvement, I shall briefly notice the objections to it.

1st.—If we were to allow considerations of expence to operate against the adoption of things to gratify our vanity, or to contribute to our comforts in our domestic arrangements or our public works, why not have our tables and chairs of common deal, instead of Spanish mahogany, and our churches built in forms of plain unbroken brick cubes? This would not

only crush invention, and retard the progress of improvement, but it would deprive contemplating minds of that pleasure which, to use the words of a celebrated author, "graceful forms and pleasing objects are calculated to produce."

Secondly,—The "increase of room" can be no objection; because, on the objector's principle, we should have all our houses constructed so small that the rooms would be but closets, for fear of increasing the ground rent; nay, we should even have our shoes made small enough to pinch our toes, lest the increase of leather would augment the price.

Lastly,—That a smaller number of more comfortable seats would reduce the clergymen's fees is very unlikely; because we find few of our churches, at present, half filled: and I doubt not but, if the seats were more comfortable, our places of worship would be more numerously attended; and although we are compelled to pay church rates, whether we attend church or not, the seat rents are at our own option. This is one of the few things which is managed by the aristocracy that we can please ourselves in. But, upon the supposition that my plan is calculated to diminish clergymen's fees, this cannot be helped. We do not build churches—I mean, we ought not to be compelled to contribute to the building of churches, however indirectly we may be taxed for the same—that are laid out in certain inconvenient ways, in order to secure larger salaries for the incumbents. And, although those who have the power may strive to prevent any improvement for the public good that trenches on *their* interests, yet the comforts of the greater number of individuals, in preference to the interests of the smaller number, will ultimately be attended to. Besides, although we may for a time suffer inconvenience, to benefit others, yet I dare say your intelligent correspondent has lived long enough in the world to find that one and all of us have too much love for ourselves to sacrifice much of our comforts to secure the interests of any one. And, further, we are so far from having a desire to curtail our own interests in our intercourse with the world, that our natures are such, that we oftentimes even grasp insensibly at things beyond what justice would allow us; and this is not a selfishness peculiar to *certain individuals, but* universal.

"For, oh! mankind are very weak,
And little to be trusted;
When self the wavering balance shakes,
'Tis *rarely* right adjusted."

I have the honour to be, Sir,
Yours, &c.
R.

Bayswater, 26th July, 1832.

MR. AUDUBON AND THE RATTLESNAKES.

A friend of Mr. Audubon's has sent to us, from Philadelphia, copies of the "Monthly American Journal of Geology and Natural Science," for November, 1831, and March and April, 1832; and referred us to certain papers which they contain, as furnishing that decisive refutation of the charges, brought by Dr. Jones, against the veracity of Mr. Audubon—which, we said, *was wanted*; and for saying which, it appears we have given as much offence to his American as British admirers. We never saw this "Monthly American Journal" before; and therein must confess, that we have been great losers; for, judging from the specimens before us, it is a very original, interesting, and truth-speaking work, and does great credit to its conductor, G. W. Featherstonhaugh, Esq. Of course, we were not aware of the vindicatory articles alluded to, when we assumed that no defence of Mr. Audubon had ever made its appearance. An expectation is expressed, by our Philadelphia correspondent, that, when we have read these articles, we will "do what justice demands." If he means by this, that we should acknowledge that we are satisfied, the charge against Mr. Audubon has been *completely* disproved, we are sorry we cannot gratify his wishes; but that the American, as well as British public, may judge for themselves, we shall briefly state what is the amount of the exculpatory evidence now brought before us.

The No. of Mr. Featherstonhaugh's Journal for November, 1831, contains an extract from a letter from Colonel Abert, of the United States Topographical Engineers, to Dr. Harlan, of Philadelphia, which is headed and relates solely to the "Habit of Climbing of the Rattlesnake. Colonel Abert says:—

"I have been informed, that some of our learned city gentlemen have doubted the truth of his representation of the rattlesnake, attacking a mocking bird's nest,

from an opinion that the rattlesnake does not climb; an opinion, by the way, more common in our cities than with the hunters in the wilds, in which this reptile is generally found. But as I am possessed of facts on this subject which prove that the rattlesnake *does climb*, I will, in justice to Mr. Audubon, relate them."

Now, "justice to Mr. Audubon," requires that it should be stated, that he never asserted, and has never, on this side of the Atlantic, been accused of asserting any such thing as that the rattlesnake "*does climb*." That there may be no mistake, we shall quote Mr. Audubon's own words.

"Rattlesnakes hunt and secure for their prey, with ease, grey squirrels, that abound in our woods; therefore, they must be possessed of swiftness to obtain them. Having enjoyed the pleasure of beholding such a chase in full view, in the year 1821, I shall detail its circumstances. Whilst lying on the ground to watch the habits of a bird which was new to me, previous to shooting it, I heard a smart rustling not far from me — and, turning my head that way, saw, at the same moment, a grey squirrel, full grown, issuing from a thicket, and bouncing off in a straight direction, in leaps of several feet at a time; and not more than twenty feet behind, a rattlesnake, of ordinary size, pursuing, drawn apparently out to its full length, and sliding over the ground so rapidly that, as they both moved away from me, I was at no loss to observe the snake gain upon the squirrel. The squirrel made for a tree, and ascended to its topmost branches as nimbly as squirrels are known to do. The snake performed the task considerably more slowly, yet so fast, that the squirrel never raised its tail nor barked, but eyed the enemy attentively as he mounted and approached. When within a few yards, the squirrel leaped to another branch, and the snake followed, by stretching out full two-thirds of his body, whilst the remainder held it securely from falling. Passing thus from branch to branch, with a rapidity that astonished me, the squirrel went in and out of several holes, but remained in none, knowing well that wherever its head could enter, the body of his antagonist would follow; and at last, much exhausted and terrified, took a desperate leap, and came to the earth, with legs and tail spread to their utmost to ease the fall. That instant the snake dropt also, and was within a few yards of the squirrel before *it began making off*," &c.

Mr Audubon, it will be observed, never uses the words *climb* or *climbing* at all; on the contrary, he seems studiously to avoid them. The rattlesnake, as all the world knows, has great powers of *darting* or *leaping;* and by darting or leaping from one branch to another, it might have accomplished all that Mr. A. here so vividly describes. Colonel Abert's "facts on this subject" only show, that rattlesnakes have been seen, by other credible witnesses, "*on* the limbs of trees," "*on* bushes," *up* a papaw tree," and *upon* the top rail of fences—not that they were ever seen in the act of climbing up them; so that his facts are really of no relevancy whatever.

The No. of the "Monthly American Journal," for March, 1832, contains a letter from Mr. Audubon to Mr. Featherstonhaugh, dated "Balowville, East Florida, December 31, 1831," in which he gives an account (like every thing else of his writing, very interesting and amusing) of a portion of his adventures during the exploratory tour through Florida, &c. on which he is now engaged. The following extract from it contains all that relates to the matter of his veracity.

"If I did not believe the day to be gone by when it was necessary to defend my snake stories, I could send you very curious accounts of the habits of these reptiles; and I should do so, if it were not that I might be thought to enjoy, too much that triumph which the feeble hostility of three or four selfish individuals has forced upon me. I receive so many acts of real friendship, and disinterested kindness, that I thank God there is no room left in my heart to cherish unkind feelings towards any one. Indeed, I am not now so much surprised at the incredulity of persons that do not leave cities; for I occasionally hear of things that even stagger me, who am so often a denizen of woods and swamps. What do you think of rattlesnakes taking to the water, and swimming across inlets and rivers? I have not seen this, but I believe it; since the most respectable individuals assure me, they have frequently been eye-witnesses of this feat. I can conceive inducements which reptiles may have for traversing sheets of water to gain distant dry land, especially in a country much intersected by streams, and subject to inundation, which compel them to be often in the water. In such countries it is not an uncommon occurrence to find snakes afloat,

and at great distances from the shore.* This appears, no doubt, surprising to those who live where there is almost nothing but dry land; still they ought to be good-natured, and believe what others have seen. It has now been made notorious, that numerous respectable individuals, whom duty, or the love of adventure, have led into the wilds of our country, have often seen snakes—and rattlesnakes, too, in trees: the good people, therefore, who pass their lives in stores and counting-houses, ought not to condemn these facts, because they do not meet these rattlesnakes, hissing and snapping at them from the paper mulberries, as they go home to their dinners. They should remember, that they ought to go further than that daily distance, if they wish to see any thing extraordinary."

Mr. Audubon, it will be seen, does not *himself* say, that he or any body else has seen snakes *climb;* only that they were seen "*in trees*," which nobody—in Britain, at least—disputes may be the case.

The No. of the M. A. J. for April, 1832, contains a Review of Audubon's two great works, "The Birds of America," and "Ornithological Biography." The Reviewer, like Colonel Abert, assumes that Audubon had been charged with describing the rattlesnake as a climber; and is equally successful with Col. A., in showing that the rattlesnake *does* what it *does not*, and what Mr. A. never said it did. *Of the other grounds on which Mr. A. has been suspected of playing on public credulity, he says not a word.*

Such, then, is all the evidence on which we are expected to say, that the suspicions we entertained of Mr. A.'s veracity are wholly unfounded! How is it *possible* that we should do so? The evidence does not touch *any one* of the points at issue. We do not know the grounds on which Dr. Jones and his "scientific friend" pronounced the "Notes on the Rattlesnake," contained in the Transactions of the Wernerian Society, to be a "tissue of falsehoods," rivaling those of Munchausen, &c.—for they have not specified any—but in order to bring the matter to a distinct issue, we shall mention briefly what those statements are, by which we have been ourselves, as well as not a few of our well-informed and thinking acquaintances, the most startled.

1.—Mr. A. asserts, that he kept a rattlesnake alive in a cage for *three* years without a morsel of food; that even though food was presented to it—though, "frequently rats, young rabbits, and birds of various kinds, were put in, sometimes alive, and at other times dead," this was done "without their being ever touched:" that it did not "grow in the least," albeit it was young; and that when rattlesnakes are subjected to such astonishing fasts, "their appearance and condition scarcely exhibit being in any want; their movements, the power of rattling, and that of inflicting mortal wounds, are perfectly kept up." Can all this be true? Why should rattlesnakes be such hunters after squirrels, and other living things, if they can thus subsist, and be well and hearty on nothing? How did Audubon make sure that his rattlesnake never ate any thing during all the three years? Was he constantly by its side all the time?

2. Mr. Audubon asserts, that the rattlesnakes reproduce their kind in the following singular manner:—

"Early in spring, as soon as the snakes have changed the skin that contained their last year's growth, they issue brightly coloured, glistening with cleanliness, and with eyes full of life and fire. The males and females range about in open portions of the forest to enjoy the heat of the sun, and as they meet, they roll and entwine their bodies together, until twenty or thirty or more may be seen twisted into one mass, their heads being all turned out and in every direction, with their mouths open, hissing and rattling furiously, while, in the mean time, the secret function is performed. In this situation they remain for several days on the same spot, and the danger of approaching such a group would be very great; for, at the sight of any enemy to disturb them, they all suddenly disengage and give chase. The fact of their rattling, which tends to alarm intruders and to warn them of their danger, is too well known to call for any observations regarding it."

We cannot well enter into the proble-

* Snakes have frequently been met with, in England, crossing broad straits. In the Mag. Nat. Hist. for September, 1831, is an account, by Mr. Bakewell, of snakes swimming across the Menai, more than two miles broad, to the Isle of Anglesea, where they deposit their eggs on the low grounds. When swimming, they produce an oscillatory motion of the head and neck.—Ed. *M. A. J.*

bilities of this delicate statement, and should not have republished it at all but that it has appeared already in a work so common to all respectable libraries as the Wernerian Transactions. We shall merely ask, — does any person believe it? Will our American correspondent himself say he believes it? Will the respectable Editor of the American Monthly Journal say he believes it? It is but fair to add, by way of warning to our American readers and friends, that were even this story of the loves of the rattlesnake disposed of, there is another, respecting the loves of the squirrel, which British naturalists find it still harder to swallow.

We have no interest to serve in this matter, save those of truth. We have no personal knowledge of Mr. Audubon, and know him only through his works, which, though very splendid and costly, (we think unnecessarily so) and very delightful reading (what more delightful than romance?) have left on our minds a strong impression, that he has used more instruments than one in his forest excursions—the long bow as well as the rifle. We *may* be mistaken—we sincerely hope we *are;* but at present the evidence, and the impressions resting upon it, lean all the other way.

THE DIAK SWORDS AND SOLOMON SECUNDUS.

Sir,—Being a plain and simple man, I had read the letter of Junius Redivivus on the subject of the Diak swords, and I must confess that his statement seemed to me all very clear and straightforward; but having since read the charges of Mr. Solomon Secundus, which I am told means a second Solomon, I take it for granted that he must know best, though I cannot well make out what he means. I always found that my penknives were brittle, and I cannot now imagine how a brittle thing can be *shaved*, but I suppose if it were put into the fire and softened, it might be so served. I suppose, also, that *shaving* a piece of soft metal and *breaking* a piece of brittle metal may be exactly the same thing, since Mr. Solomon so represents it. I also thought that Junius meant that musket-barrels might be chopped in pieces by repeated blows when *laid on a block, but that* no single blow *from the best of swords* would be sufficient in time of action to chop a musket-barrel in two pieces; and the detachment of Sepoys whose muskets were cut through by the Sultan of Cotis' mandows, must, I suppose, have been held in the position of the charge when they were cut at, which I thought Junius meant by the phrase *held in human hands;* for it is not to be supposed that, after the battle was over, Sultan Cotis' men would have amused themselves by cutting the muskets to pieces. But, however, Seljie said that his people with their mandows would have cut the muskets clean through, —of course, meaning in time of action. This, Junius did not believe: and, indeed, I felt rather doubtful about it; but since Mr. Solomon believes it—and, of course, he must know best—I shall believe it too. It would be very disgraceful not to believe it, when Seljie tells it, and Mr. Dalton and Mr. Solomon both believe it. The matter is three to one. It has been put about that Mr. Solomon is a junior counsel studying for a special pleader; and three witnesses are, I believe, always considered decisive in law, even against probability. I should recommend, that in future the cavalry soldiers be armed with Walby's trowels, in order to cut through gun-barrels; for, of course, there can be no difference between being seated on horseback or on the chair of a public-house, or whether the thing cut at be stationary or moveable. After the discovery of Mr. Solomon, working engineers will be able to chip pinions, and other small wheel work, as they go along the streets to their dinner, with a Walby's trowel; and it is to be feared that, out of mischief, area rails will be cut down like saplings along the streets. The atrocity of Junius in talking twice of that same Runic smith is doubtless great; for quotations are not made to be used more than once, and should forthwith cease to be remembered.

To conclude, Mr. Solomon has shown so clearly that he knows much better than yourself what kind of contributors should find admission to your Magazine, that I think the least you can do is to make him a co-editor; more especially as he has been so largely a contributor of valuable information tending to further the progress of the useful arts. I therefore move, that Junius be forthwith dismissed, and not allowed any longer to waste the time of your readers,—first, for using so terrifying a signature, and, next, for the

utter inutility of his communications, added to their unmatchable dulness.*

Yours, &c. FERRUM.

July 21st, 1832.

FINDING THE CONTENTS OF PLANE TRIANGLES.

Sir,—I am not fond of throwing cold water on other persons' inventions, but I cannot refrain from observing, on considering the "instrument for finding the *contents* of plane triangles," described in the 53d page of the current volume of your interesting Miscellany, that it is not to find *the area*, but to *ascertain the half of the perpendicular line of a triangle whose three sides are given*. Now, I cannot see why we should require the assistance of any thing so expensive, complicated, and cumbersome, as a large square graduated board and three rods or scales turning on hinges and sliding in grooves, when the same thing can be done much more readily and with greater accuracy with a pair of compasses and a common diagonal scale. I conceive that A.'s instrument will be nearly useless, unless the square board and the three scales be so finely divided and contrived, as to lay down or measure lines to two places of decimals at least, for it is not to be expected, when triangles are proposed for solution, that they are always to be such as A. has selected to elucidate the use of his instrument, viz., 18, 16, and 14, all whole numbers; for the greater chance is, that one or more of the sides will be fractional, perhaps to two or three places of decimals; and even in the triangle proposed by A., the half of the perpendicular is not found correctly, the whole perpendicular being both by arithmetical calculation and scale measurement, 11·924, the half of course 5·962, making the contents of the triangle 107 3, instead of "106 nearly," as he has it. With regard to the quadrantal arc hinted at by A. to be described on the square, I beg to observe, that would prove of little service, unless it were furnished with a nonius; for angles cannot be laid down correctly without such assistance.

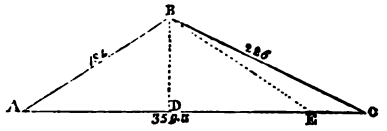
And now, Sir, that I am on the subject of triangles, I beg leave to refer to page 45 of your 14th vol., where there is what is called an "Improved Method of obtaining the Area of a Triangle," which, like A.'s instrument, is only to find the perpendicular of a triangle whose three sides are given. Unless prolixity be desirable, I am yet to learn how this method can be called an *improvement*; which observation will also apply to Anthony Peacock's method, page 341, in the same vol. The following *very old rule* is shorter than either, viz. As the base or longest side, is to the sum of the two shortest sides, so is their difference to the difference of the segments of the base; or, in other words, to the excess of the larger segment above the lesser, viz. EC, which excess being subtracted from the whole base, the half of the remainder will be the lesser segment AD. The square of which subtracted from the square of the lesser side gives the square of the perpendicular. In order that this may appear more plain, I subjoin the work, with the diagram;

And am, Sir,

Yours, respectfully,

TEMPORA.

Kentish Town, July 14, 1832.



Base. Sin. Diff.

359·3 : 410 :: 42

42

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28480

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1882

359·0 = base.

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155.687 = A.D.

SMITH'S FLOUR-DRESSING MACHINE.

Sir,—A few days ago I had occasion to call at the very extensive flour mills of Mr. Edward Hudson of Leeds, called the King's Old Mills, in which are 40 pairs of stones, besides a considerable number of presses for extracting the oil from rape and linseed. Among the

* Does any one second the motion? We venture to say not one. We hope Junius Redivivus will, spite of Solomon and his pleasantry, long continue to enrich the pages of the Mechanics' Magazine with his instructive and entertaining communications.—*Ed. M. M.*

many ingenious contrivances for facilitating the work, my attention was particularly taken up with a patent Flour Dressing Machine, the use of which must be of very extensive advantage to the miller.

The patent was obtained by an ingenious man of the name of Smith, who resides in Bradford in Yorkshire; he has not introduced the machine many miles from his own town; and, although it is the best piece of machinery of the kind I ever saw, I fear that for want of its merits being known to the trade, it will remain in oblivion. The great advantage this machine possesses over any other I have met with, is its being constructed entirely of iron and brass, so that it is not subject to warp and get out of truth, or to wear out, like those made of wood. It has also an appendage, which I never saw in any other flour-dressing machines. Down the outside of the cylinder, there is a round iron shaft, on which are fixed round brushes —which shaft is constantly revolving and brushes the flour out of the wire, while a slow motion given to the cylinder presents the surface of it to the brushes. When wheat is damp, a very great advantage will be found in keeping the wire constantly clear. By a contrivance in turning two or three screw nuts connected with the inner brushes, the arms can be lengthened or shortened, so as to make them press more or less on the wire. The whole is considered a cheap piece of machinery, and likely to be very durable. I am informed that one of these valuable machines may be seen at the warehouse of Mr. Bryan Corcoran, No. 36, Mark-lane, London.

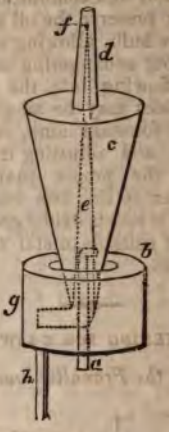
By inserting this in your valuable Magazine, you will do a great service to millers, and, I hope, to the ingenious inventor of the patent flour dressing machine.

Your obedient servant,
W. R—— C——.

DR. ANDREWS' OIL GAS LAMP.

The following engraving represents an oil gas lamp for which a Dr. Solomon Andrews, of Perth Amboy, New Jersey, has recently taken out a patent. For the *following description* we are indebted to *the Franklin Journal.*

This invention consists in having the gas lamp so constructed that the heat of the inflamed gas, or gas light itself, operating upon the oil, or other substance used for the purpose, will continue to form, to supply or feed the gas light. In the accompanying drawing, the letter

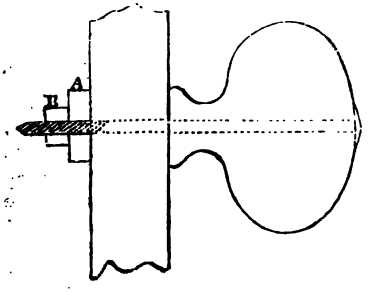


a represents a part of the supply tube, through which the oil or other material enters, of which the gas is made; *b* the upper end of the supply tube emptying into the bulb; c the bulb, represented in the form of an inverted cone, which may be filled with fine wire, to communicate heat the more readily throughout the contained fluid, the gas being generated in this bulb; *d* a turret erected to cover the gas tube *e*, which is best elongated so as to extend above the bulb to prevent any particles of oil or other substance from entering the gas tube: *f* the entrance into the gas tube, which descends down through the bulb into the gas recipient *g*, through holes or orifices in the sides of which, the gas which is to be inflamed, issues. A waste tube, *h*, is intended to carry off any surplus oil. The oil to be decomposed enters the orifice of the supply tube, passes up that tube into the bulb, where it is converted into gas by the heat of the flame surrounding it. The gas rises to the top of the bulb and turret, and passes down the gas tube into the recipient, whence it issues through the opening at which it is to be lighted. The surplus tube serves to conduct any particles of fluid which have come down with the gas and thereby prevents ob-

struction. In order to light the lamp, oil must be admitted into the bulb; this part may be heated by a common candle or lamp, but will be much facilitated by using a small blow-pipe. When a small portion of gas issues through the openings in the recipient, it will inflame, and the generation and combustion be continued. To preserve the oil at a proper height in the bulb, allowing a sufficient supply without endangering its rising too high, and flowing into the gas tube, several devices may be adopted, as by the common fountain lamp, or by using a stop cock, and adjusting it so that no more than the proper quantity shall enter. Silver is the best conductor of heat, and as it resists oxidation is esteemed the most suitable metal for making the apparatus.

SECURE FASTENING FOR DRAWER KNOBS.

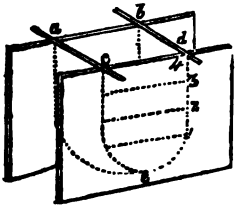
(From the Franklin Journal.)



A is the ordinary nut; B an extra nut of an octangular or hexagonal form. Put on the knob and spindle as usual, and screw up the nut A until the knob has any desirable degree of tightness. Then place a plate of brass or iron on A so as to keep it from turning, and screw B strongly against it. If this is properly done, it will be found that on turning round the knob and spindle they carry both the nuts with them. The reverse of this in ordinary cases is the cause of the knobs becoming so often loose. The use of two nuts clamping each other is familiar to all persons conversant with machinery; all the merit now claimed, is that of applying this well-known contrivance to the remedying a domestic annoyance, which, from its frequent occurrence,* may be termed a serious evil.

W. H.

APPLICATION OF THE CATENARY CURVE TO NAVAL ARCHITECTURE.



Sir,—I am not aware that the "catenary curve" has ever been used in "naval architecture."

I beg, therefore, without further observation, to propose the following questions:—

1st. Will the "catenary" be the same in water as in air?

2nd. Suppose a belt of any elastic substance were suspended between two planes in water, and the space within *a b c d* loaded with sand or any other loose material to the several heights, 1, 2, 3, and 4; what would be the form of the curve *c e d* in each case?

3rd. Would the curve be the same if loaded to the same depths with materials of different specific gravities?

4th. If an elastic vessel, with its transverse and longitudinal sections formed and loaded as above, were dragged through water at different velocities; what variations in its shape, if any, would take place when going at different rates?

Some years ago, when my attention was directed to the forms of ships, the idea of thus applying the catenary curve occurred to me.

I beg to add, if it should prove important, I will send you some other thoughts, which have been suggested by it.

I am, Sir,
Your old subscriber,
H. G——.

* More frequent, we suspect, in the United States than elsewhere. In Great Britain, he would not be counted a "nob" among cabinet makers who made his knobs in so loose a style.—Ed. M. M.

AMERICAN SILK.

The following is an extract from a letter from P. S. Duponceau, Esq., which was sent along with some cocoons produced on the estate of the Hon. Henry Bry, of Monroe, district of Ouachita, Louisiana, to the managers of the exhibition of the Franklin Institute in October, 1831.

"I have the pleasure of sending you a parcel of cocoons, weighing something less than two pounds, for which I beg you will obtain a place at the exhibition of the Franklin Institute. These cocoons are all that remain of a large quantity sent to me as a present by the Hon. Henry Bry, of Monroe, in the district of Ouachita, in Louisiana, and are the production of his estate. Although not remarkable for their size, they contain more silk than any I have ever seen, or, indeed, that I have ever heard of in any part of the world. Fourteen pounds and six ounces of them have produced, on reeling, three pounds eleven ounces of fine raw silk; which is about three pounds and three-quarters of cocoons to one pound of silk; which is truly astonishing, when it is considered that in Europe twelve pounds of cocoons are required to produce one pound of silk. I am speaking, it is true, of cocoons containing the live chrysalis; but allowing twenty-five per cent, which is a large allowance for the loss of weight by baking, and the diminution during the voyage from the interior of Louisiana to this city, it would still have required, on the European calculation, nine pounds of cocoons to produce one pound of silk, whereas that quantity was obtained from less than four. I have witnessed this fact, and can attest it of my own knowledge. You will observe that the cocoons are hard and compact; they reel off quite to the chrysalis, which fell of itself into the basin without a single particle of silk. I have thought this explanation necessary, in order that the extraordinary excellence of these American cocoons may be fully understood. The next best cocoons I have received this year, were sent me also a present by the lady of Thomas Sumpter, Jun., Esq., the son of the venerable General Sumpter. They were raised on the family plantation at Statesburgh, in *Sumpter district, South* Carolina. Five pounds of these produced one pound of raw silk, and no doubt would have produced more if that excellent lady had not been confined to her bed by sickness, and could have attended herself to the rearing of her silk worms, as I had some before of her raising which did not yield to those of Louisiana. I have kept none of these cocoons, having converted them all into silk; they were of a large kind, and very beautiful.

"I have seen cocoons as fine in their appearance as those I have mentioned, but none that produced so much silk; from whence I infer, that our southern districts are admirably calculated for this production."

ENGLISH AND AMERICAN SETTLERS.

Sir,—Mr. Hounds, in No. 466, seems to be upon a wrong scent, whether owing to his own "dull comprehension," or to my inaptitude for explaining my meaning, I shall leave to your readers to pronounce. But, as your correspondent appears to labour under the impression that I wish to exalt the Yankees unjustly, at the expense of Englishmen, I must beg him distinctly to understand, that I have no such wish, but merely desire to render unto every one his due, giving each credit for the excellence peculiarly belonging to him. Thus, while I perfectly agree that an English farmer will cultivate land much more neatly, and produce more from a given portion of surface, than an American will; I also affirm, that the American is far better fitted than the Englishman to vanquish the difficulties of a new settlement in the forest, because, that has been the peculiar business of a large portion of Americans ever since the first settlement of their country, and, consequently, they are for the most part familiar with what is necessary to be done. In the case of the transport of the artillery, a contract was open, to the amount of many thousand dollars, and an English subject would have been preferred could one have been met with, for reasons which will readily strike any man who has had experience of government patronage. No English subject offered; because it was supposed that the task could not be accomplished, and if accomplished, that it would be at a loss to the undertaker. Under these

circumstances, the Yankee made his calculations, and after the Governor had despaired of getting the matter accomplished, he made his offer, and by some shrewd management, contrived to secure the use of the government horses, which had not been originally contemplated. He so managed his work, that he scarcely used any but government horses, and nearly the whole of the payment he received became profit. The "risk" in the matter, was, loss of time, labour, and material employed, if unsuccessful. When the task was accomplished, many English subjects complained that the work had been given to a Yankee. I think, that, after this explanation, Mr. Hounds will agree that some shrewdness was exhibited by the Yankee, and consider it "satisfactory."

With regard to the land in Canada, it was given away at the period I was there, and I was not aware of the change that had taken place in that particular. It now remains to be seen, what effect it may have in turning away the stream of New England emigrants.

I imagine Mr. Hounds is not a Londoner, or the term "*lucky* escape," would have been more familiar to him. It, perhaps, savours of a vulgar mode of expression, but he must excuse that in a poor man like myself, who has not had the benefit of a University education. For the farther information of Mr. Hounds, the "lucky escape" I made was to Philadelphia, where ague is rarely known. My reason for stating that Ohio is unhealthy, is not from personal experience, but from considerable intercourse with numerous Ohio settlers, who are in the habit of visiting New England every autumn, to recover their strength. Had Mr. Hounds seen their yellow sickly looks he would not have doubted the truth of their statement, that fever and ague were the great drawbacks on the fertile country they had settled in. Quinine was the medicine principally used for it; but, notwithstanding, it usually took a strong man from four to five years to get acclimated.

Another proof of Yankee enterprise may be found in the fact, that the line of stage communication between Montreal and Upper Canada has been entirely planned and executed by Yankees, under difficulties which would have deterred most Europeans, and which are still spoken of by the passengers, who now accomplish, in a few days, a journey, which formerly occupied them for weeks. Those same Yankees are now realizing a large fortune by the scheme, whose execution had brought them so nearly to ruin, that another week of outlay without income would have stopped them.

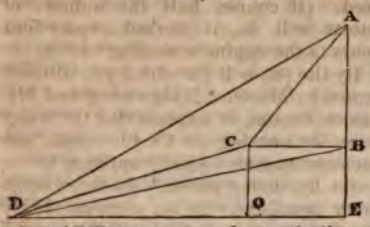
So far from wishing to stop "Britons" from going to Canada, I warmly advise every Englishman who sees no prospect at home but daily labour to the end of his days, to scrape together forthwith, by any honest means he can, the means of shipping himself off. In Canada, with industry, he must infallibly rise to a competence, if not to wealth. But an Englishman, who has only been accustomed to one kind of labour, will assuredly not thrive so fast as the Yankee who has been accustomed to several kinds. The Yankee has served his apprenticeship in youth to the needful knowledge and skill, and the Englishman must do the same after he has grown up. This argument must surely convince any one who is not wilfully prejudiced. I believe that a London mechanic settling on a Canada farm, would thrive better than an Essex farmer, simply from the fact, that both would have to begin anew; and the mechanic would be versant in more arts, and would be more plastic than the farmer. Settling in uncleared Canadian woods, and being obliged to resort to expedients, is a widely different thing from cultivating the cleared lands of England, "with all appliances and means to boot."

I abhor all those national distinctions which beget ill blood, and I look forward with confident hope to the time, when English, Scotch, Irish, American Unionists, and Canadians, together with the colonies which have been settled by them in other parts of the world, shall all merge in the name of Anglo-Saxons. May those who shall endeavour to set strife between them, either for gain, or for the gratification of other bad passions, be the first to perish in it!

I remain, Sir,
Very truly yours,
JUNIUS REDIVIVUS.

July 23, 1842.

THE "CASE IN PLANE TRIGONOMETRY," VOL. XVII., P. 78.



Let ABC represent a figure similar to the one required; draw CB, DE parallel to the horizon; make the angle BAD = 71°.39′ (the complement of the given angle EDA) also the angle CBD = 3 .45′; let BD and AD meet in D, and join DC. Assume AB to be equal to any number at pleasure, say 10. Then $AC = \frac{10}{\text{Sin. } 29°.30} = 20{\cdot}308$, and $AD = \frac{10 \text{ Sin. } 93°.45'}{\text{Sin. } 14°.36'} = 39{\cdot}587$. Hence, in the triangle ADC, are given the two sides AD, AC, and the included angle DAC (11°.9′) to find DC—which, by trigonometry, will be found to be 20·0535. But, by the question DC is given = 53·75. Hence, $\frac{53{\cdot}75 \times 10}{20\,0535} = 26\frac{1}{2}$ feet, the required height of the object.

Otherwise.

Draw CO perpendicular to DE. Calling DB = 10; then BE and DE will be the sine and cos. of the angle BDE to the radius ∴ BE = 6·54031, and DE = 9·9786. Hence,

As sin. BAD (71°.39)	9·9773354
To sin. ADB (14°.36)	9·4015201
So DB 10 - -	1
To 2·6557 - - -	0·4241847
As rad. - - -	10·0000000
To cos. ACB (29·30) -	10·2473580
So AB - - -	·4241847
So BC 4·6940 - -	0·6715427

Hence, from 9·9786
Subtract 4·6640

5·2846 = Do.

Hence, DC = $(5{\cdot}2846^2 + 6{\cdot}54031^2)^{\frac{1}{2}}$ = 6·3249;

Wherefore, 5·3249 : 53·75 :: 2·6557 : 26·8 = 26¼ feet, the height of the object.

E. J. ERICHSEN,
Pupil, Mansion-House, Hammersmith.

[We have also received solutions of the case from three other correspondents, but we give the above as being, on the whole, the best.—ED. M. M.]

BROWN'S GAS VACUUM ENGINE.

Sir,—In answer to the query at the end of the statement, in your last number, on the subject of the gas vacuum engine, I write to say, that the quantity of coals put into the coke oven to heat the retorts, on the night before you inspected the engines, was eight bushels, and that the quantity of best oven coke produced was rather more than twelve bushels. This charge would have been sufficient to keep the three retorts hot twenty-four hours by my new process, and, consequently, to work off four charges in them, and to produce 8,400 feet of gas. When you saw the engine, only one charge had been worked off, as no more gas was then wanted: the twelve bushels of oven coke produced by the above charge, as well as the nine bushels retort ditto produced from the six bushels of coals put in the retorts, were placed in two heaps, for the inspection of the gentlemen who attended on that day and may still be seen there, and the above account verified by any one who may doubt the statement. Will you allow me to add, that pillar engines, on the same construction as the one you saw here, may be made to discharge 4,000 or any number of gallons per stroke, with the same facility as the one now at work here discharges 750.

I am, Sir, yours, &c.

SAMUEL BROWN.

Eagle Lodge, Old Brompton, 2d August, 1832.

Sir,—It is a long time since I had the honour of addressing you on the subject of Mr. Gilman's generator. I am now induced to tresspass again upon your pages by my surprise at your raising from the dead our old defunct friend the *gas vacuum engine*. Although I am not superstitious, I really believe this must be its ghost come to try whether he can amuse (to use no stronger a term) the natives in his aerial, as he did before in his corporeal form. Joking apart, Sir; I

have no hesitation in saying, that the invention in question is not one jot improved since it was brought into existence nine years ago, nor one degree nearer perfection, notwithstanding Mr. Brown's assertion, that he "is fully borne out by the results of experiments" in stating that he has produced an engine "that will do every thing and cost nothing," and that the "only difficulty," viz. that of making gas cheaper than steam, is removed. Is it indeed removed? By what means, pray? By setting the retorts in a coke-oven I suppose. Well, but is that plan peculiar to the generation of gas only? Did not Mr. James Surrey, on the 4th of September, 1823, and M. De Jongh, on the 28th of February, 1824, take out patents for applying the heat of a coke oven to generate steam, precisely in the same manner that Mr. Brown applies it to make gas? Will not, therefore the profit (if any) arising from this process be obtained in generating steam by it, as well as the gas? And if so, how does Mr. Brown's gas vacuum engine progress one step in advance of the steam-engine, to which the coke oven was first applied, and which, I believe, is still in operation by Mr. Surrey at Battersea? But Mr. Brown tells us, that among the new discoveries in the science of gas making, not the least is the fact that "one cubic foot of gas will make, on an average, forty feet of vacuum!" Without stopping to inquire into this extraordinary *fact*, viz. that one fortieth part, or 2½ per cent. of gas, in commixture with 97½ per cent. of atmospheric air, will produce an explosive mixture, I will content myself with telling him, that if one cubic foot of gas will produce forty feet of vacuum, it is no less true that one cubic foot of water will produce between *seventeen and eighteen hundred* feet of vacuum, and that each of these feet of vacuum is equal, in effective power, to nearly three of his gas vacuums. But, taking the steam vacuum as only twice as good as the gas vacuum, then one cubic foot of water will produce about three thousand five hundred of comparative vacuum; being about ninety times as much as Mr. Brown produces from a cubic foot of gas. I imagine, therefore, this will be a sufficient set off in favour of steam. I will now, if he will allow me, ask Mr. Brown how many retorts, and of what size, set in a *coke oven, will be required* to work the *engine, which you estimate* at ten-horse power, generating gas (as is the case with steam in a steam-engine) as it is used. Of course, half the number of retorts will do, if worked twenty-four hours to the engine's working twelve.

By the paper B (to which you allude) signed by Mr. Geo. Mainwaring and Mr. James Burton, it appears that the water raised by working the Croydon canal gas vacuum engine, which appears to be about five-horse power,* for three hours every two days, "is an average supply for the general purposes of the canal." If, then, Mr. Brown consume as much gas in three hours (which I am informed is the fact) as he makes in forty-eight hours, he must either get all proprietors of engines to oblige him by working only one hour and a half per day, or, in case the engine is required to work twelve hours every day, he must have eight times the number of retorts for a five-horse engine that he has at the Croydon canal: all of them being worked night and day. A pretty establishment truly for working a five-horse engine! As Mr. Brown has discovered so charming a method of making gas, that it not only costs nothing, but yields absolutely a profit in making, I hope that we shall soon find that the gas companies, instead of charging 12s. 6d. per thousand cubic feet, will at least supply the public gratis, if not indeed give each customer a bonus for consuming that which produces such a profit beyond the expence of making.

Is it not clear, from what I have said, that there is something rotten in the state of Denmark? If Mr. Brown will not tell you what that rottenness consists of, I will. The fact then is simply this, that the heat produced by the process of making coke, whereby the atmospheric air is as much as possible excluded, is too feeble to generate either gas or steam with sufficient rapidity to effect any good general purpose; and in generating the latter, so great an extent of gasometers is required, as cannot, under common circumstances, be submitted to,—no matter what the profit may be, nor whether the gas be for illumination or for working Mr. Brown's gas vacuum engine. If coke ovens will answer for producing gas for the latter, they will also do so for the

* You estimate the engine with a cylinder 4 feet 8½ inches diameter, at 10-horse power; consequently, the Croydon engine, having a cylinder 3 feet 6 inches in diameter, must be a little more than half that power; the area of the former being 2507 inches, and that of the latter, 1385 inches

former purpose. I believe the plan has been fully tried at more than one gas establishment, and found impracticable. The particulars of some of these trials I may, perhaps, be able to communicate to you in a future letter.*

When an engine is required to work only three hours out of the forty-eight, as at Croydon, it comes within the bounds of *possibility* that the *gas vacuum engine* may be used; but when an engine is required to be in operation twelve or more hours per day, it is impracticable without such an extent of gasometers and number of retorts and coke ovens, even if they be worked night and day, as no one will submit to. Besides, it is no trifling inconvenience that so enormous a cylinder as one of twenty-two feet high, and three feet six inches in diameter, is required for a five-horse engine, in addition to the room required for the gasometer, retorts, coke ovens, &c. If such be required for a five-horse engine, what sort of cylinders, &c. &c. &c. &c. would be necessary in a steam-vessel requiring one hundred horses' power? I suppose a second vessel at least would be required to contain a floating gas and coke establishment, and there ought to be an accompanying fleet of vessels to carry customers to purchase and consume the coke. Oh! but I had forgotten that "Mr. Brown has discovered a plan by which gas, fit for the working of his engines, may be produced in large quantities from water, by an apparatus of very small dimensions, and consuming a a very small quantity of fuel," and that "this method of generating gas will render the invention peculiarly applicable to the propelling of vessels." No doubt he can produce more gas than steam from water, and at less expence. Why then did he not give us this panacea for all the diseases of his gas vacuum engine, instead of amusing us with his other piece of discovery about coke ovens? I regret, as much as any man, that ingenuity and ability, or even industry without them, should go unrewarded; but, after a lapse of nine years, if no greater an improvement be made on in invention, than the application of the coke oven is upon the gas vacuum engine, I really think an inventor ought, however reluctantly, to submit and cease to press upon the public plans which he must be conscious, from experience, never did, and never can, answer any general good purpose.

I am, Sir, in great haste,

Your very obedient servant,

A PRACTICAL ENGINEER.

July 30th, 1832.

* *We shall be glad to receive them.* — ED. *M. M.*

IRON STEAM BOATS.

Sir,—I observe that an iron steam-boat, erected by Messrs. Maudslay for the East India Company, will shortly make its appearance, when, I trust, you will be enabled to furnish your readers with full particulars respecting her.

I have for a long time thought that iron might be advantageously used in the construction of steam-boats. About two years since, I was spoken to about the model for an iron steam-boat to be built in Staffordshire, but the project was not carried into effect for some reason with which I am unacquainted.

Iron steam-boats might be very advantageously employed in exploratory expeditions, as they would draw but little water and contain a much larger quantity of fuel than boats of the ordinary construction. They are exceedingly well adapted for colonial purposes, not only because of their security against the ravages of the worm, but also because they admit of being sent out in parts, and erected on the spot where they are required; thus avoiding the expense of fuel for navigating them several thousand miles.

All the iron boats which have been hitherto built (for canals, chiefly) have been ugly mis-shapen things; but I see no reason why the most approved models should not be copied, and equal elegance and symmetry given to an iron steam-boat as to those of the ordinary build.

Can you or any of your readers inform me by whom the Aaron Manby, which was sent to Paris, and plied for some time on the Seine, was built—how long since, her dimensions, and power—how she has answered the purpose for which she was intended, and if now in existence?—Yours, &c.

G. BAYLEY.

July 27, 1832.

P. S.—A few years since an iron steam-boat was tried on the Clyde, and it is said with success—What is become of her? G. B.

The iron steam-boat alluded to by Mr. Bayley, as having been constructed by Messrs. Maudslay and Co., was

launched from their wharf on Saturday last. She is named the *Lord William Bentinck*, and is intended to be employed as a tug-boat on the Ganges. Her length is 125 feet, breadth of beam 22 feet. She is entirely composed of iron with the exception of the decks, which are of wood. The plates vary in thickness from one-quarter to three-eighths of an inch. She is to be fitted with a pair of engines of 30-horse power each, with vibrating cylinders; and it is calculated that she will be able to tow at the rate of 7½ miles per hour an iron carrying vessel of the same dimensions, with a load of fifty tons. The draught of both vessels is estimated not to exceed two feet. The actual draught of the Lord William Bentinck on Saturday, with nearly 100 persons on board, without engines, was stated to be only 13½ inches. There is an opinion prevailing — and Mr. Bayley, we observe, concurs in it — that an iron vessel can be made much lighter than one of wood; but we entertain great doubts of its accuracy. The specific gravity of iron, as compared with wood, is about 1 to 14; therefore, supposing an iron boat to be composed, like the present, of iron plates generally one quarter of an inch thick, it follows that a vessel built with fir planks, three inches and a half in thickness, would not displace any greater quantity of water. Such a thickness of wood, however, is not wanted in rivers where light draught is chiefly wanted; so that it should seem vessels might be constructed of wood for internal navigation, that would draw even less water than vessels of iron. Security from the ravages of the worm, and facility of transportation, are undoubtedly great advantages on the side of iron; but, on the other hand, considerable deductions must be made for the liability of iron to oxidation, and its greater cost.

We heard lately that the "Aaron Manby" was still in existence, and plying on the Seine, where its name has been, naturally enough, corrupted into the "Iron Manby." We are not in possession of any other information respecting it.—Ed. M. M.

FAMILY CABINET ATLAS.

We take blame to ourselves for not having sooner noticed the admirable little *work which has been* for some *time publishing by Mr. Bull*, of Holles-street, under the above title. Its merits, as a mechanical production merely, are such as to claim for it the most honourable mention at our hands. We have seen nothing more beautiful in map engraving than the plates of this work, by Starling; the letter-press also, by Bensley, is extremely elegant. We have been particularly pleased with the Biblical Series of Maps, which has been just completed. They are stated to have been "engraved from original drawings by a gentleman of great Biblical research, who has devoted a period of nearly twenty years to this branch of Scripture illustration;" and bear all the marks of great labour and research. To the maps, there is annexed a very elaborate index, which exhibits, at one glance, all the prominent circumstances, geographical or historical, by which every place mentioned in Holy Writ is distinguished—its classical and modern names; longitude and latitude; distance and bearing from Jerusalem, &c. On the advantages of such a help to the reading of the Scriptures, we need not enlarge. Every Family Bible ought to have, for its companion, the Biblical Series of the Family Cabinet Atlas.

THE VOICE OF HUMANITY.

We observe, with great pleasure, the completion of a second volume of this quarterly publication; regarding it as a proof that the benevolent and useful Association for Promoting Rational Humanity towards the Animal Creation, of which it is the organ, continues to thrive and flourish. Humanity to the brute tribes, and humanity to our fellow-creatures, are much more nearly akin than superfical thinkers are commonly willing to allow. They are twin-born fruits of civilization, and destined to prosper or perish with it. So all-persuasive is the influence of mild and humane sentiments, that it has been remarked, that as the characters of men become softened and improved, so do even the characters of the brute tribes domesticated with them. The English bull-dog offers a remarkable example. It is no longer the ferocious creature which it once was; still as lion-hearted as ever, but comparatively docile, social, and companionable,—presenting therein a very type of the change which has come over the spirit of John Bull himself, and verifying to a wonder the old proverb, "like master like man."

BARON DRAIS'S TACHYGRAPHICAL MACHINE.

Baron Drais presents his compliments to the Editor of the Mechanics' Magazine, and begs to thank him for the favourable manner in which two of his inventions have been spoken of in the Mechanics' Magazine, Nos. 463 and 464. In reference to the remark made by the Editor, that if a machine for copying merely could be constructed without the necessity of abridgment, it would be of great utility, Baron D. wishes it to be known, that he constructed a machine for that purpose previous to the stenographic machines now ready. It was not till after he had done so, that he proceeded to the attainment of the object which to him seemed more important, namely, the giving full and clear reports of Parliamentary proceedings and debates. To that end he constructed the machine described in No. 464, and he apprehends it is so constructed as to be capable of being used either to write short-hand or to write without abridgment.

Baron Drais wishes for a partner to co-operate with him in taking out a patent for the invention and bringing it into practical use.

His address may be procured at No. 340, Strand.

London, July 20, 1832.

New Comet.—About 11 o'clock on the night of the 19th July, M. Gambart, Director of the Observatory at Marseilles, discovered a new comet. It is very small, and without a train, but is invisible to the naked eye. Its position in its right ascension is about 252 degrees, and in its declination, 26 degrees. This comet was also observed at Paris on Wednesday (25th July) when its right ascension was 242 degrees, and its declination only 16 degrees. —*Galignani's Messenger*.

English and American Chain Cables. — It is stated in the Franklin Journal that American-made cables are not to be trusted; "not because the iron itself is not equally good with the foreign, but because there are some bad links in nearly every chain that give way when submitted to the test, which the imported cables will uniformly bear." The cause of this difference is under investigation.

Maternal Affection of the Bat. — The female (taphozous rufus—red bat of Pennsylvania) has been known to manifest the strongest maternal affection. A young lad having caught two young bats of this species, was in the act of bearing them off to the Philadelphia Museum at midday; being watched by the mother, she followed him through the streets, fluttering around him, and eventually settled on his bosom, preferring captivity to freedom with the loss of her progeny.—*Featherstonehaugh's—Month. Amer. Journ.*

American Substitute for Oil Paints.—Pour one gallon of boiling water upon one pound of quick lime and two ounces of sugar of lead. When the lime has become completely slaked, the mixture is to be stirred, and it is then fit for use. If required thicker, less water must be used. Colouring ingredients may be added at will. It is said, that the cost of this composition paint is about one-thirteenth that of oil paint, and that it is nearly equal to it in beauty. When exposed to the weather, however, it requires one coat of oil to protect it. A patent has been taken out for this composition by a Mr. Klipstone, of New Baltimore, Virginia.

The Fire-King again.—No small degree of interest has been excited by the appearance among us of M. Chabert, of Paris, who professes to have discovered antidotes for some of the most lethal poisons. Since his arrival in this country, Mr. C. has repeated most of his experiments both in Philadelphia and New York, particularly those with Prussic acid and phosphorus, the former of which he exhibits to animals; the effects of the latter he generally tests upon his own system, swallowing with perfect indifference from twenty to forty grains. Mr. C. has favoured me with the following remarks relative to the operation of this poison on himself. It produces in the first instance exhilarating effects, succeeded, sooner or later, by a transitory sense of depression or faintness. In the course of a few hours, however, the most powerful and painful aphrodisiacal effects are the consequence if the dose has been very large, frequently repeated, and especially if he has permitted three or four hours to elapse previous to taking the antidote; his bones become affected with pain and soreness throughout the skeleton, so as to render the usual pressure almost insupportable; his complexion also changes to a bilious hue, and his bowels become costive. All that Mr. C. has informed me of concerning the nature of his antidote for phosphorus is, that it is of an animal nature.—*Dr. Harlan: American Monthly Journal of Geology, &c.*

Raising Sunken Goods.—A person has obtained the sanction of the Admiralty to descend by means of air-pipes to the wreck of the Boyne, late of 98 guns, which, it may be in the recollection of many, caught fire by accident at Spithead on the 1st of May, 1795, at eleven in the morning, drifted from her moorings, and finally blew up, about six in the evening of the same day, opposite Southsea Castle. At low-water the wreck is approached at about two or three fathoms. A ladder of sufficient length reaches the wreck from a vessel moored over. The person descends, his head enveloped in a large leaden mask, with glass eyelets, protected by small brass bars, and his body covered with an Indian rubber dress, having his hands perfectly free, as also his legs and feet. By this means he traverses the wreck, and has been enabled to suspend a few 24-pounders, which were hoisted into the vessel above. This afternoon (July 20th) he discovered what is supposed was the wine-store of the late captain (Sir George Grey). He succeeded in raising 21 bottles. He refused an offer of 20s. per bottle, but generously opened one as a tasting for the bystanders. It was found to consist of port and claret, and has been 37 years immersed in the sea. The bottles were covered with large barnacles. The agreement with Government is, that the adventurer is to have all except the copper, which is to be lodged in the dock-yard, and of which he will have salvage.—*True Sun*.

INTERIM NOTICES.

We think "Honestus" will be of opinion, that after a certain letter which he will find in our present Number, the insertion of the one with which he has favoured us on the same subject is unnecessary.

We have not been able to lay our hands on the letter of S. P. for overlooking something in which he took us to task.

A letter for Mr. Abraham Booth has been addressed to the care of our Publisher.

Communications received from Mr. Iveson—A Young American—Mr. Hiort—Saul Pinnim—A New Subscriber—496—Naturæ donum—Emilius.

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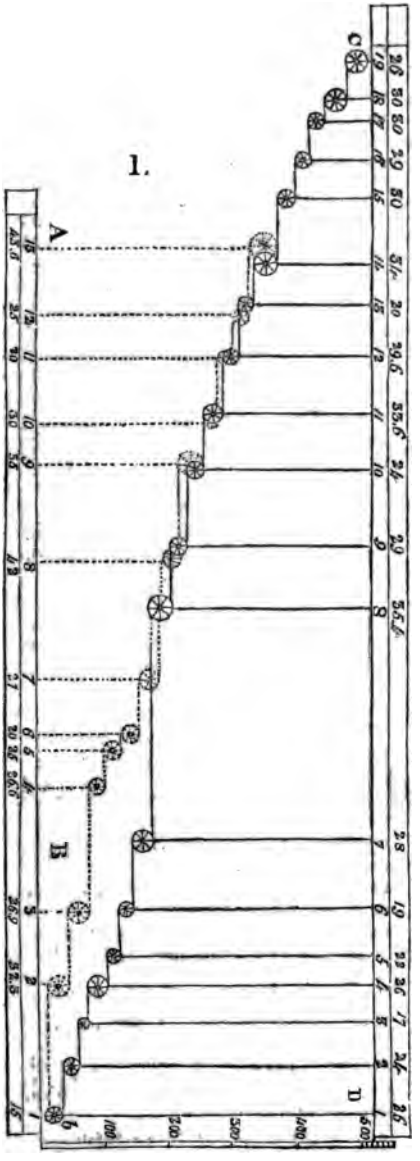
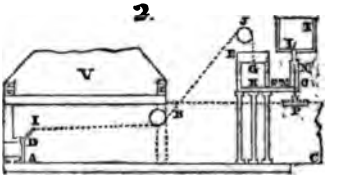
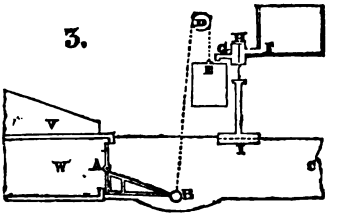
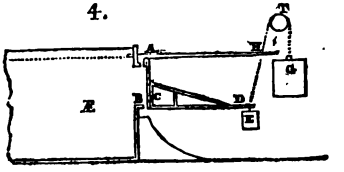
THE GREENOCK WATER-WORKS.









THE SHAWS' WATERWORKS, GREENOCK.

In a paper in the last Number of the Gardener's Magazine, entitled "General Results of a Gardening Tour from Dumfries, by Kirkcudbright, &c., to Paisley," by Mr. Loudon, there is an account of the Shaws' Waterworks for the supply of the town of Greenock, which Mr. Loudon pronounces to be the "most stupendous" of all the public works which he saw in the course of his tour. The account is, however, of a general nature, such only coming within the scope of a "Gardening Tour;" but Mr. L. states in a note that he had "sent a pamphlet, in which these works are described, to the Editor of the Mechanics' Magazine, in whose publication they will probably be recorded for the benefit of engineers." We have to thank Mr. L. for his polite attention in forwarding the pamphlet alluded to, and for being thus enabled to lay before our readers the following very complete details of what is, in truth, not only a "most stupendous," but a most ingeniously designed and well-executed work. The engineer is Mr. Robert Thom, already favourably known to the profession by his plans for the supply of water to the Rothsay Mills.

The town of Greenock is situated on the banks of the Clyde, at the bottom of a sloping ridge or hill, the top of which is 512 feet above the level of the river. Before the erection of the Shaws' Works the town was so ill supplied with water that during every dry season it had to be carted from a distance for the ordinary supply of the inhabitants. To remedy this evil several surveys were made at different times by different engineers, but without effect till 1824, when, at the desire of the late Sir Michael Shaw Stewart, the proprietor of great part of the land on which the town is built, Mr. Thom explored all the neighbouring country, and reported that it was practicable to obtain for the inhabitants, not only an abundant supply of water for all domestic purposes, but such *a supply as would also impel machinery to an extent equal at least to all the machinery then impelled by steam-power in and about Glasgow.* In consequence of this report, a Joint Stock Company, with a capital of £31,000, was incorporated by Act of Parliament for carrying Mr. Thom's plans into effect.

The main source of the supply is the *Shaws' Water,* (whence the name of the works), a considerable stream, which is met with three or four miles to the rear of the high ridge above the town, in a wild and craggy district, which the good people of Greenock have, with a sense of importance that puts one in mind of the superlatives of Madrid, named "The Back of the World." Contributions are also obtained from a number of smaller streams in the vicinity. The supplies from these different sources are collected in one "Great Reservoir," a "Compensation Reservoir," and six "Auxiliary Reservoirs," the contents of which are as follows:—

	Cubic Feet.
Great Reservoir . . .	284,678,550
Compensation do. . .	14,465,898
Six Auxiliary do. (about)	10,652,775
Total	309,797,223

From the Great Reservoir the water is first conveyed by an aqueduct to the north or outer side of the range of heights which lie between the bed of the Shaws Water and the Clyde, and then along these heights to the top of the ridge we have before mentioned as immediately overlooking Greenock; the water being thus led for a distance of 6½ miles *round* the barrier which it could not *pass* over. The course of this aqueduct, and the relative localities of the different reservoirs, &c., are shown in fig. 6.

The Great Reservoir (V) is connected by a tunnel with the Compensation Reservoir (W). At the upper end of this tunnel (A), there is a common upright lifting-sluice; at the lower end a self-acting sluice, of Mr. Thom's invention, which keeps the water in the Compensation Reservoir uniformly at a given height.

To enable the reader to understand the manner in which the self-acting sluice operates, and to appreciate the merits of its construction, we must first describe two different plans which Mr. Thom had contrived for the purpose, and which are represented in figs. 2 and 3, front-page.

In the *first* plan (fig. 2), AB is the tunnel through which the water flows into the reservoir BC; AD, a sluice that turns upon pivots at the upper part D; ID, a lever attached to the sluice AD; EF, a hollow cylinder; GH, another cylinder (water-proof, and of rather less specific gravity than water), which moves up and down freely within the cylinder EF; IBG, a chain, one end of which is

Fig. 6.

fixed to the lever ID, and thence passing over pulleys B and J, has its other end fixed to the cylinder G; KL, a cistern, kept always full of water; LMF, a pipe, that communicates between the cistern KL and the cylinder EF; NO, a spindle with two valves O and N; P, a float, that rises and falls with the water in BC; V, the embankment between the two reservoirs. The water in BC is here represented at its greatest height; with, of course, the sluice AD and valve N shut, while the valve O is open. Suppose, now, that water is drawn from the reservoir BC, the float P will have a corresponding fall, and leave the spindle NO, which descending *by its own* weight, *shuts the valve O and opens* the valve N. The water then passing from the cistern KL into the cylinder EF, raises the cylinder GH; on which, the pressure of the water in front of the sluice AD, throws it open. Again, when the water issuing from BC is stopped, its surface rises, and with it the float, which pushing up the spindle ON, shuts the valve N and opens O, when the water in the cylinder EF escapes; on which the cylinder GH falling, shuts the sluice D as before. In this way the surface of the water in BC is always kept at the same level, whether the quantity drawn from it be great or small.

In the *second* plan (fig. 3) A is the sluice, which turns upon pivots at its centre of pressure; AB, a lever, attached to

that sluice, which, with the small weight B at the extremity, is heavy enough to overcome the friction of the sluice and keep it shut; AC, the reservoir; D, a pulley, which turns easily round its axis; E, a light, hollow cylinder of copper, with a very small aperture in its bottom, and open at top; BDE, a chain, which is fixed at one end to the lever at B, then passes over the pulley D, and is fixed at the other end to the cylinder E; F is a cistern, kept always full of water; FG, a pipe, which communicates between the cistern F and the cylinder E; H, a valve, that opens or shuts the communication FG; I, a float, that rises and falls with the water in AC.

By making the sluice, as in the second plan, turn on its centre of pressure, the weight of the column of water resting on it, is neutralised; it being, at the same time, equally exerted to open and shut the sluice. The acting-power has, therefore, only to overcome the friction, to make it move in any direction; whereas, according to the first plan, the power must not only overcome the friction, but must also be equal to half the weight of the column of water pressing upon the sluice (the other half being borne by the pivots on which the sluice turns). The apparatus is also simplified by having only one cylinder and valve, instead of two of each, as in the first plan. This second plan is not, however, without its disadvantages. The sluice when it turns upon pivots at its centre is more difficult to make water-tight than when it turns on pivots at one edge; neither does an equal aperture pass an equal quantity of water, for besides the space occupied by the sluice in the centre, it also tends to disturb the regular flow or current of the water. Further, the apparatus as thus constructed does not work so smoothly as according to the first plan, the cylinder E, and consequently sluice A, moving by starts.

After some experience of both methods, Mr. Thom found that a combination of the two answered better than either, that is, making the sluice turn on pivots, near its centre, as in the second plan, with cylinders and valves, as in the first; which is accordingly the form which has been followed at the Shaws' Waterworks, in the construction of the self-acting sluice. In this way the motion is preserved very smooth and uniform, while the power necessary to open and shut the sluice, and, consequently, the size and expense of the cylinder, are greatly lessened.

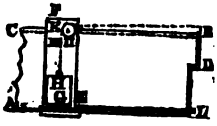
This self-acting sluice is also made to operate as a waster for the Great Reservoir, when necessary, by the following contrivance:—A tube passes from the top of the reservoir, or at least from the greatest height to which the water is allowed to rise in it, to the cylinder EF. Whenever the water rises so as to flow into this tube, the cylinder EF becomes filled and the sluice AD opens; and, on the other hand, whenever the water falls so as not to flow into the tube, the sluice AD shuts and acts as before. This tube is, of course, made to convey into the cylinder EF more water than the valve O can pass.

Water-sluices, as represented in fig. 4, are also placed on a bye-lead (P), cut into the solid ground at the east end of the embankment of the Great Reservoir, to pass the surplus water into the Compensation Reservoir. AB is the sluice, which turns on pivots at the upper edge; ACD, a lever; E, a hollow cast-iron can, dependent from D, into which small stones are put till it is heavy enough to shut the sluice against the pressure of the water in front; F, a pulley; G, a hollow copper cylinder, with a small aperture in its bottom; DFG, a chain; AH, a tube, which communicates between the water in front of the sluice AB and the cylinder G.

The flow of the water from the Compensation Reservoir (W) is regulated by the arrangements represented in fig. 5, which are in most respects similar to those we have just described. At C there is a common upright lifting-sluice; at D a self-acting one; E is a regulating basin, connected with the rivulet *a*; Q, a bye-lead cut into the solid ground at the east end of the embankment of the Compensation Reservoir, to carry its surplus water into the old bed of the Shaws Water (Y); T, a waster-sluice, placed on the tunnel, leading from the basin E, which passes the surplus waters into the bed of the Shaws; *ee*, a catch-water drain; F, the commencement of the aqueduct.

The water-sluices on the bye-lead Q of this reservoir are somewhat different from those on the bye-lead P. The construction of them is represented in fig. 7.

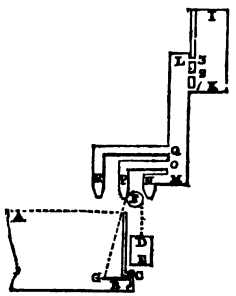
Fig. 7.



BC is the high-water line, or the greatest height to which the water is allowed to rise; BD, the sluice or folding-dam, which turns on pivots at D; EF, a hollow cylinder, having a small aperture in the bottom, to which is joined EL, a small pipe, which is always open; 1111 are small holes in the cylinder EF, on the line of high-water mark; GH, another cylinder, water-proof, that moves up and down freely within the cylinder EF, and the weight of which keeps the sluice BD shut by its connection with BKH, a chain, which connects the cylinder GH with the sluice BD. The mode of operation will be immediately obvious. The dimensions and weight of the cylinder GH are, of course, made to correspond with the weight of the column of water pressing on the sluice BD.*

On the partition RS, which separates the basin E from the aqueduct F, there are six weather-sluices, of equal apertures, so contrived that they shall at all times supply exactly as much water as wanted to the aqueduct, and no more. They are constructed in the manner represented in fig. 8.

Fig. 8.

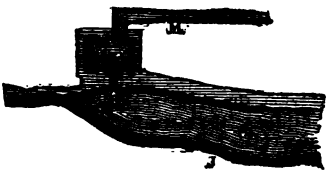


AB is the basin (E); BC, the sluice, which turns on a pivot at C; DE, a light can of copper, open at top, with a small aperture in the bottom; F, a pulley; G, a lever, attached to the sluice; GFD, a chain; IK, the suction of the auxiliary rivulet, near where it enters the regulating basin, and close to the aqueduct; LMN, a pipe, which communicates between the rivulet at IK and the can DE; OP is another pipe, which communicates between the pipe LMN and a second can, the same as DE (not shown, however, in the figure); 1, 2, 3, are apertures which communicate between the rivulet IK and the pipe LM. When the can DE is full of water it shuts the sluice BC, but when empty, the pressure of water in front of BC throws it open. The aperture in the bottom of the can DE keeps it always empty, except when the quantity running in is more than that aperture can discharge.

Similar weather-sluices are attached to the different auxiliary reservoirs; and on the aqueduct, wherever rivulets are intercepted by it, self-acting wasters, such as before described, are placed to pass the surplus waters of *extraordinary* floods into the former bed of the rivulet.

Near the summit of the hill above Greenock the aqueduct terminates in a regulating reservoir, called the Whinhill Reservoir, whence the water is distributed to its ultimate destination in the manner represented in fig. 8.

Fig. 9.



KJ is the Whinhill Reservoir; KI, a tunnel between it and the basin below IL. On the upper end of this tunnel a common upright lifting-sluice is placed, and on its lower end, a self-acting sluice, similar to the one on the tunnel of the Great Reservoir. From this basin the water is sent down the hill in two

* "On this principle a self-acting dam may be raised in any river or stream, up to high-water mark, by which means a considerable reservoir will be obtained; whilst during spates the dam will fold down, and no new ground be flooded. In lawns or pleasure-grounds, through which streams or rivulets flow, *these sluices might* be applied to advantage, for by placing one on the bank of each pond, the water within would always be kept at the same height, whether the weather were wet or dry; and hence flowers or shrubs might be planted close to the water's edge, or in it (as best suits their respective habits), and their position with regard to water would always be the same."—MR. TRAIN.

different streams NO and OY (see fig. 6) that it may serve to turn two different lines of water-wheels. In fig. 8, M represents the lead to the upper mill of the line NO, or eastern line. In the partition which separates the basin IL from this mill-lead, an aperture (L) is made, which, with the water in the basin at the assigned height, passes exactly the stipulated quantity. On this aperture a self-acting valve is fitted, which opens whenever the water is required for the upper mill, and shuts again whenever that mill is stopped.

Fig. 1, on our front-page, is an imaginary section, drawn from the summit of the hill, through both series of water-wheels, to the level of the Clyde at high-water; AB denotes the former line; CD the latter.

Between every two mills a waster-sluice is placed on the level part of the lead, which keeps the water there uniformly at a given height. In this way the supply to the mills is kept quite regular and uniform; whilst it is out of the power of any one mill either to keep water from, or set back water upon, any other mill.

Having thus made our readers acquainted with the localities and construction of the various reservoirs, aqueducts, basins, sluices, &c., we shall now leave Mr. Thom to explain in his own words how they serve to collect and economise the water, and to provide a regular supply to the mills:—

"Suppose the weather to be very dry, the auxiliary reservoirs all empty, the common upright lifting sluices every where open, and the whole supply required from the great reservoir. In this state of things, the six weather sluices on the basin (E) below the compensation reservoir, being all open, will pass the necessary supply into the aqueduct; the self-acting sluice (I) on the tunnel between the Whinhill reservoir and basin (IL) just below, will pass it into this basin; and the self-acting valve (L) will pass it into the mill lead (M) and thence to the mills. Whilst, therefore, such drought continues, it is only necessary to throw open the common upright lifting sluice (C) on the tunnel of the compensation reservoir in the morning, and shut it at night; and the several self-acting sluices will bring home exactly the stipulated quantity of water to the mills.*

The Whinhill reservoir being in the first instance about half filled, will retain or supply any surplus or deficiency occasioned by the waterman opening or shutting the sluice (C) of the compensation reservoir a little too early or too late.

"But suppose the weather to become wet, and that the various rivulets and surface water, draining directly into the aqueduct, now sends as much water into it as one weather-sluice passes—then one of the six on the basin (E) will shut, and the rest remain open, till by the continuance of the rain the quantity thus flowing into the aqueduct becomes equal to what two weather sluices pass, and then a second one will shut;—when it becomes equal to what three pass, then a third one will shut; and so on till all the six are shut; should the flood still increase, and the quantity thus flowing directly into the aqueduct become greater than the mills require,—then the weather sluices on the auxiliary reservoirs will, in the same manner, shut in succession, and detain the surplus water in these reservoirs. If the flood becomes so great as to send more water into the aqueduct—after all these sluices shall have been shut—than the mills require, then the wasters on the aqueduct will open and pass the surplus down the beds of the rivulets, as formerly stated.*

"Whilst the flood thus continues, so will the sluices; but when it abates, the wasters on the aqueduct will shut as the flow of water into it lessens. When it lessens so much as no longer to afford the stipulated quantity to the mills, then the weather sluice which shut last will open and supply the deficiency: when the deficiency becomes greater than this sluice can pass, then the weather sluice,

* "*Were the aqueduct, between the compensation reservoir and the Whinhill*, quite level, then the regorging of the water when the mills stop, would shut the self-acting sluices D and B, and thus render unnecessary the opening and shutting the hand-sluice (C); but in order to make a smaller and less expensive aqueduct serve, it has been made with a declivity which prevents this. As it is, however, nothing depends upon the water man but merely opening and shutting this sluice at the appointed hours; as the quantity of water brought to the mills will be always regulated by the self-acting sluices; and even if he should be sometimes not quite exact (which will happen) as to the time of opening and shutting this sluice, the regulating reservoir at the Whinhill will, nevertheless, keep the supply to the mills quite uniform."

* "This, however, can hardly happen, except in the event of a very extraordinary flood, simultaneously with the sudden melting of a great body of snow; and even then all the auxiliary reservoirs, as well as that at the Whinhill, must first have been filled. But in the event of the water in the aqueduct being raised above the assigned height—whether by a great flood, by the falling in of its banks, or any other cause—these wasters will then open, and prevent injury (by overflow) to the banks of the aqueduct or the grounds below."

which shut second last, will open and supply the farther deficiency; when the deficiency becomes greater than the two sluices can pass, then the weather-sluice that shut third last will open and supply this farther deficiency;—and so on, as the flood abates, and the drainage into the aqueduct lessens, till the whole of the weather sluices are again open.

"In the above description we have supposed a flood of such magnitude and duration as to shut the whole of the weather sluices in succession. This, however, will not often happen:—in most cases the rains will abate by the time that one, two, or three of them have shut; but at whatever stage it may cease or abate, those sluices that have shut will always open again in succession, as the drainage into the aqueduct lessens; and thus, at all times, and in all kinds of weather, pass exactly the stipulated quantity of water to the mills, without waste and without water man.

"It has been stated that the six weather sluices at the basin (C) will exactly pass the quantity of water required by the mills. It may therefore be supposed, that, when the weather sluices of the auxiliary reservoirs are also open, the whole twelve will pass too much water to the mills. But it will be observed, that the sluice which shuts last is always the one that opens first, and so on in succession: and as, by construction, the last of these sluices can never shut till at or near the end of the greatest flood, they can only be shut for a very short period, and of course have collected very little water; and, therefore, what any one of these auxiliary reservoirs may have thus collected, will always be run off by the time that the third or fourth, after it in rotation, has opened; so that from the construction of these auxiliary reservoirs, there can never be more than six of the weather sluices passing water to the mills at any one time.

"It is also to be observed, that the very use and design of the reservoir at the Whinhill, is that of a regulator, for preventing any small irregularity in the conveyance of the water along the aqueduct; from affecting the regular supply given out by it to the mills, as well as to retain part of the water of extraordinary floods, which would otherwise have to be wasted from the aqueduct. Hence it is obvious, how important a part these auxiliary reservoirs and self-acting sluices perform in this system of water power."

To show that the supply will be fully adequate to all *the probable* wants of the town, Mr. Thom gives the following calculations:—

"The whole annual supply, originally estimated by Mr. Thom to be brought to Greenock, was 600,000,000 cubic feet. The company have stipulated to supply the east line of mills with 1200 cubic feet per minute, for 310 days (of 12 hours each) in the year; and it is intended to give an equal supply to the west line. This will amount to 535,680,000 cubic feet annually. Taking the population of Greenock at 25,000, and allowing for each individual two cubic feet a day, this will require 18,250,000 cubic feet annually; which leaves, of the original 600,000,000, 45,070,000 cubic feet annual, for the public works and other purposes. But the experience of the two last years has proved that the available drainage into the various reservoirs now formed, is above 700,000,000 of cubic feet annually; and it will be observed that the reservoirs are capable of containing a full supply for the whole consumpt for more than six months; so that not only the surplus waters of one wet season may be retained for supplying the dry season of the *same* year, but the surplus of *several* wet years stored up to supply a drought of several years duration, should such ever occur."

Mr. Thom, it will be recollected, commenced his operations with reporting that the supply would be such as not only to meet all the domestic demands of the inhabitants, but also to "impel machinery to an extent at least equal to all the machinery then impelled by steam power in and about Glasgow." He made this statement on the supposition, that there might be 200,000,000 cubic feet of water to spare for machinery; and he calculated the available power thus:—

"The quantity of water obtained (200,000,000 cubic feet) is sufficient with a fall of 30 feet, to give a force equal to that of a hundred horses; but from the level of the aqueduct at its termination above Everton to high-water mark at Greenock, there is a fall of above 500 feet; but taking it at that height, and applying the water through the whole of the fall, we shall have a power equal to that of 1666 horses; and if we divide this power by 33, we shall have that number of public works, each having water power fully equal to that of 50 horses."

But as we have before seen, the Shaws' Water Company have found themselves enabled to contract to supply the two lines of mills with 535,680,000 cubic

feet annually, so that the power obtained must be nearly triple what Mr. Thom first reckoned upon. Mr. Thom now inclines to think that water might be obtained to not less an extent than 5000 horse power; and in that case, he estimates that the saving by the substitution of water for steam would be not less than £150,000 per annum. On the sort of mania which prevails for preferring steam before every other description of power, he makes the following sensible remarks:—

"It is not to be inferred from this that I think lightly of the great effects produced by the steam-engine; I merely wish to draw a little attention to another source of national wealth which has been hitherto very much neglected. I shall not now enter into an investigation of the various causes which may have led to this neglect; but perhaps the brilliant success of the steam-engine has had no small share in it. The halo that encircled the brow of Watt seems to have attracted almost all the aspiring mechanical genius of the age to the steam-engine; and the more natural, but less attractive, powers of water were of consequence thrown into the shade. Such indeed has been the eclat of the steam-engine hitherto, that whenever a work became scarce of water, either from its being enlarged or from a dry season, nothing was to be heard but the general cry—"Put up a steam-engine and be independent of water;" and many a striking instance might be pointed out, within 50 miles of Glasgow, where such advice has been acted upon, when less than the first cost of the steam-engine would have procured a full and perpetual supply of water. This, however, cannot last; and therefore instead of the general cry "Put up steam-engines and be independent of water," we may soon expect to hear substituted, "Get water if you can, and be quit of these smoky and expensive engines." But, although desirous of directing a little attention to a different object, I am fully sensible of the great importance of the steam-engine. The wonderful effects it has already produced upon the trade of the kingdom, or rather of the world, independent of the still more wonderful effects yet to be produced by its application to navigation, (where water-power can never apply), are more than sufficient to render the name of its great improver immortal."

It still remains that we should notice the very excellent arrangements which Mr. Thom has made for filtering so *much of the* water as is required for domestic uses, and for sugar and other manufactories, where pure water is essential.

"A separate aqueduct has also been made to carry this water to the filters, just above the town, where a basin has also been made, large enough to contain something more than a day's supply of the filtered water. This aqueduct, which is fully 15 inches square, is perfectly water-tight; being formed with stone, nicely joined and cemented; and costs something less than one-third the price of a cast-iron pipe of equal capacity. Wherever the pressure is not great, such a conduit is preferable to an iron pipe; as the water by passing over stone is rather improved than injured, which is not the case with iron. In this aqueduct, (which is deep enough in the earth to avoid the frost of winter and heat of summer), cesspools are formed for the deposit of sediment; it being desirable that the water should be as pure as the nature of things will permit before it enters the filters.* The medium through which the water percolates in these filters has been made such, as not only to detain any *sediment that may remain*, but also the *colouring matter* of moss-water and other similar impurities, should there chance to be any such.† Three filters are now formed; each is 50 feet long, 12 wide, and 8 deep. The water is made to percolate through them, *either upwards or downwards, at pleasure.* When it percolates downwards, and the supply of filtered water becomes sensibly less—which, after some time, must happen to every filter, by the lodgment of sediment—then, by shutting one sluice, and opening another, the water is made to pass upwards with considerable force, and, carrying the sediment along with it, falls into a waste-drain made for that purpose. When the lodged sediment is thus removed, and the water begins to run clear, the direction of the sluices is again changed, and the filter operates as before. If the water usually percolates upwards, then, as before, when the quantity of filtered water falls short, one sluice is shut

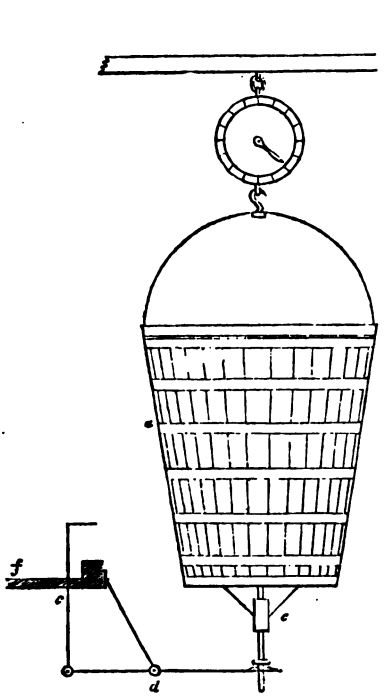
* "Because the less sediment there is in the water when it *enters* the filter, the more water will the filter produce; and with regard to moss-water, or water in which such matter is *dissolved*, the substance used to remove such matter, will, in time, become *saturated*, and must then be exchanged; and as this is expensive, there should no moss-water be allowed to enter the filters that can be prevented."

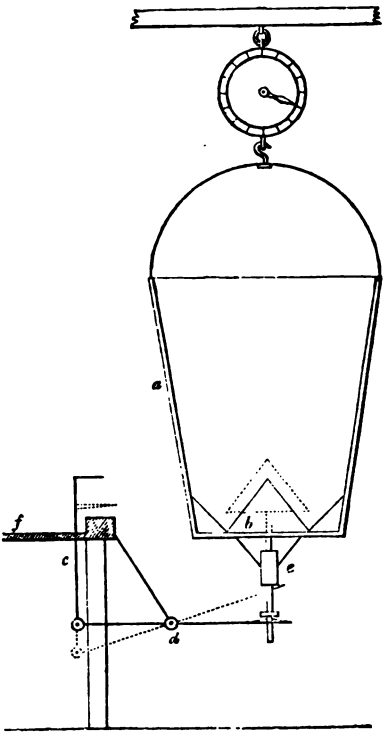
† What the substance is by which the colouring matter is described, we are not informed; it is elsewhere, however, said to be "rather expensive." What reason can there be for this concealment?—Ed. M. M.

and another opened, and the water, passing downwards with considerable force, carries the sediment along with it into the waste-drain. In either case, the sediment is removed, and the filter again at work in less than an hour. This much sought for desideratum in filters has, therefore, at last been found; and Greenock is now supplied with abundance of pure water, at the very low rate of 6*d.* the pound of rental, being only half the price paid in Edinburgh and Glasgow."

TUB FOR MEASURING AND WEIGHING CORN.

(From the Gardener's Magazine for August, 1832.*)*





"I have lately invented a tub for measuring and weighing corn, which, I think, promises to be very useful. Corn of all kinds is here sold by the coomb, of four imperial bushels; but though nominally by measure, yet reference is always had to weight as well; and, accordingly, in buying grain, some idea is always formed, by the buyer, of its weight per coomb. If, on delivery, it falls short of this estimated weight, recourse is had to the bushel, to ascertain whether the quantity contracted for has been delivered. The measuring and weighing, being separate processes, take up a good deal of time; a vessel, therefore, by means of which the two operations might be combined in one, became a desideratum. The main difficulty consisted in the emptying after weighing, &c. To this end, a movable bottom appeared requisite; and, taking a hint from the water-balances in coal-pits, the valve *b* (see fig.), was devised, as best adapted, by its conical form, to penetrate the body of the grain in the tub, and to allow of its free egress from the same when raised for that purpose. The next

question was, as to the best mode of raising the valve. An ingenious mechanic of this place, of the name of Robinson, has effectually removed all my difficulties on this head, or, I should rather say, foot, by the application of the lever *d*, which is put in action by the pedal *c*, as shown by the dotted lines. When the foot is applied to this pedal, the valve is raised, as shown in the figure, and the corners of the tub being rounded (see the section), the tub is emptied in quick time. Of course the tub should be suspended high enough above the floor to allow the corn sufficient room to escape. To this end, a platform *f*, something like what is here called a horsing-block, is necessary. Up this platform the man bearing the sack of corn walks; and, the mouth of the sack being previously untied, shoots the contents, very gently and gradually, into the tub. I say gently and gradually, because, without this precaution, there will not appear to be full measure, although, properly delivered, there may be no actual deficiency. The mode of weighing may be either by Marriot's dial engine, or by a steelyard beam. The former is, perhaps, the most correct, certainly the most simple, and the most scientific; though three out of the four we have put up at the Whittington malt-houses, near this place, are on the latter plan.

"SAMUEL TAYLOR.

"Stoke Ferry, Norfolk, June 1832."

SOLUTION OF THE MECHANICAL ENIGMA.

Obscur'd by dust, thy 'nigma feign would lie
Hid, like the Delphic Oracle, from mortal eye;
But Science, spurning mystery and fraud,
Laid bare the cheat which once our fathers aw'd;
She now steps forth her mighty power to show,
And tear the secret from thy 'nigma's brow;
What, though it through a thousand changes pass,
She still pursues, converting dust to GLASS:
GLASS, she declares, thy 'nigma will explain,
And, well as friends, will *cut* the mystic chain.
Glass! valued good! dear child of Science, hail!
Thou aid'st thy parent when she else might fail;
Tho' Franklin had a head as clear as thee,
A heart as pure, from blemishes as free,
As when thou cam'st into our teeming land
All bright, and spotless, from the artist's hand;
He much had left undone, had you not came,
To add fresh laurels to his mighty fame.
Newton, like him, without thy kindred aid,
His wondrous talents had not half display'd.
And tho' *flint*-hearted, still a general friend,
Freely to all, thy valued help you lend;
Philosophy, the arts, the jovial, and the free,
All, all, proclaim how much they owe to thee.
The still in vapours spreads thy fame around;
The microscope reveals thy powers profound;
At the convivial board thou tak'st thy place,
Making wine sparkle, with thy chaste embrace;
Through thee we tread, where else we ne'er had trod,
"And look thro' Nature up to Nature's God."

J. DOUSBERY.

Crown-court, Golden-square.

BLAST LAMP.

Sir,—I have observed that the flame *of a common argand* oil-lamp is hot *enough to render* thermometer tubes flexible, and from reflection upon the causes of the intensity of this flame, as well as of that produced by the blow-pipe, it occurs to me, that a most powerful blast

lamp could be constructed, possessing all the intensity of the blow-pipe flame, with as much body as may be required. The plan, which I shall merely sketch, any of your correspondents will find it easy to embody and prove, should he think it worth while. It is, to construct a lamp with a wick of the required size nearly solid; viz. composed of a number of wicks, each passing through a circular tube. The tubes being laid close side by side, will produce a solid flame, while their interstices will give passage for a blast of air to be forced through the wick. A collar, slightly conical, may surround this bundle of wicks, a little higher than their tops, and serve to bring the flame to a focus.

I am, Sir,
Your obedient servant,
Φ. M.

ANSWER TO THE MESSAGE FROM THE FAIRIES.

Sir,—The question proposed by your *spiritual* correspondent Oberon, in No. 464, may be very easily solved. The circumference of the earth is = 360 degrees; consequently, Puck's velocity, if he traversed it in 40 minutes, must have been = $\frac{1}{40}$ degrees per second, supposing that it remained stationary during his progress.

But the earth turns on its axis in 24 hours; in 40 minutes then it must move 10 degrees: so that $\frac{1}{2400}$ of this added to the above, will be the rapidity with which he travelled, if going in the same direction as the earth, and subtracted from it, if the reverse.

In the former case the velocity is $642\frac{7}{8}$, and in the latter $608\frac{1}{8}$ miles per second.

I am, Sir,
Yours, respectfully,
J. W. H.

INTEREST AND DISCOUNT.

Solution of the 5th Mathematical Question, vol. xvi. *p.* 187.

Question.—A banker discounts bills at equal intervals so as to have four returns of his money in the year. B improves an equal sum at compound interest, payable quarterly. Suppose both to have the same interest for their money, in how many years will the banker be twice as rich as B?

Answer by the Proposer.

In my answer (vol. xv., page 304) to the question on this subject, as first proposed (vol. xv., page 62), I calculated the log. of the amount of the banker's capital at the end of n years to be

Log $(h$ — Log. $(h-r)\ hn$ + Log. a; where h = 4, and r = 05;

Also, the log. of the amount of the same capital, when improved at compound interest, at the same rate and time = Log. R × hn + Log. a, where R = 1·0125 ∴ By the question,

Log. $(h$—Log. $(h-r)\ hn$ + Log. a = Log. R × hn + Log. a + Log. 2.

From which we obtain:

$$n = \frac{\text{Log. } 2.}{(\text{Log. } h - \text{Log. } (h-r) - \text{Log. R})\ h}$$

Log. h (4)	-	0·6020600
Log. $(h-r)$ 3·95	-	0·5965971
		0·0054629
Log. R (1·0125)	-	0·0053950
		0 0000679
		4
		0 0002716

Hence $\frac{\cdot 3010300}{\cdot 0002716}$ = 1108½ years.

E. J. ERICHSEN.

March 27, 1833.

APPLICATION OF MR. BROWN'S GAS VACUUM ENGINE TO THE PROCESS OF BOILING SUGAR IN VACUO.

Sir,—It has never happened that your interesting publication has contained within the limits of one number the particulars of two such valuable discoveries as those mentioned in No. 468. The improved mode of Messrs. Oaks and Son, by which pure sugar can at once be manufactured from the canes in so much larger proportions and superior samples to any yet discovered, promises to confer a most important benefit on our distressed West India Colonies; while the first article in the same number describes a process of obtaining a vacuum by gas, which, while it is applicable to every branch of our manufactures in

which steam is now used, seems peculiarly adapted to the above invention. By the present mode, sugar is obtained by boiling the juice from the cane in vacuo; and this vacuum is produced by an air-pump worked by a steam-engine. Now, Sir, I think it must strike any one who has seen the power of Mr. Brown's gas-pillar engine, that it would produce the vacuum here required in a much more effective manner than any steam-engine and air-pump, however well constructed, could do. It is, in fact, a large cupping-engine, which may be at once applied to the vacuum pan, and bring its whole power to bear on the required point without the aid of machinery, and without friction, or loss of power. But, besides this, another very material point may be gained, which might not, perhaps, strike your readers if it was not adverted to: viz. at present the canes are burnt in the furnace to contribute to heat the boiler of the steam-engine. But, by Mr. Brown's process, the canes would first be used in the retorts to generate gas, of which they contain an immense quantity, and the residuum, which would be the finest charcoal, would produce more than sufficient fuel for all the purposes required in the process. I trust, that as both these discoveries are, by a curious coincidence, united in one number of your publication, so they will, ere long, be also united in the general use of a process, by which our sugar islands will be raised from the great depression under which they have so long suffered.

I am, Sir,
Your very humble servant,
AN AMATEUR MECHANIC.

Aug. 2, 1832.

MR. PERKINS' NEW MODE OF GENERATING STEAM PROVED BY EXPERIMENTS TO BE FALLACIOUS.

Sir,—When I first heard of Mr. Perkins' "new mode of generating steam," I could not help doubting the efficacy of the arrangement; but to satisfy myself, I proceeded to experiment, and accordingly manufactured an apparatus as described; the result, however, only tended to confirm my scepticism, as with the heating power the same, the same quantity of water was raised to the *same degree of heat*, in precisely the same time without the circulator as with it. Since the time at which I made the above experiment, I have been to the exhibition in Adelaide street, Strand, where the "new mode, &c." forms a prominent feature, but where, I am free to confess, I have seen nothing to convict me of prejudice; for if with the circulator, the fluid is not raised to a certain degree of heat in *less* time than without it, or, which is the same thing, if the fluid is not raised to a *higher* degree of heat in the same time, where is the economy obtained by the introduction of the circulator? The fact is, the circulation, which it is well known exists in all fluids during the operation of heating, cannot be increased by *interior* arrangement, but only by *exterior*, and that by either increasing the heating power, or by extension of the surface exposed to the given heating power. The latter mode being carried to the greatest extent (at present) in Messrs. Ogle and Summer's boiler, is the cause of what appears to be to Saxula (and no doubt to many others) exaggerated statement. I beg to add, that if he is really in want of the boiler he describes, it would be worth his while, if he has leisure, to make a journey to Milbrook Foundry, near Southampton, where I can promise him, as the result of my own experience, treatment perfectly gentlemanlike, and statements he may depend on.

I am, Sir,
Your obedient servant
and constant reader,
H. C.

Aug. 3, 1832.

HOUSE-TOP DEFORMITIES — SOCIETY FOR THE IMPROVEMENT OF ARCHITECTURE SUGGESTED.

Sir,—In the midst of the many improvements which have taken place both in the domestic and public buildings of this country, there is still one prevailing and apparently an increasing defect, I mean in the construction of chimneys. For, notwithstanding that several individuals have directed their attention to the subject, and numerous suggestions have been published in your pages, the evil seems on the increase, and the means now so generally resorted to for the cure, are so devoid of all classical

character as to become the *foulest blots* on our architectural productions.

Although smoky chimneys are so numerous, there are few architects or builders who can anticipate whether the buildings they design or erect will be subject to such a nuisance. This, I think, is manifest by the great care they generally take to have their chimney-tops neatly and uniformly finished. When we see so much care and expense bestowed upon the chimney-tops, whether it be the whole of a new square, a new street, or a new house, it is reasonable to suppose that the architect is satisfied that not a chimney will smoke. But, alas! how generally do we see these fine terminations become pedestals for every foul thing in the shape of a cowl, a mitered, a caped, an uncaped, a vandyked, a perforated, a conical, a crooked, or straight "tall boy"—or, to support a black pot, or a red pot, or some of the numerous devices which start up in such great profusion and variety as soon as a new house is inhabited, or an old one changes its tenant; thus, as it were, proclaiming from the house-top, that the architect and builder have been unsuccessful, and that some variety or other of the tinker's or potter's whims, to charm or coax out the smoke, have prevailed!

Contemplate the appearance of a new street, an extensive new square, or of such a city as London, without one unsightly object above its roofs: contrast these with the appearance when the creatures of disfiguration have done their dirtiest work, and spires, domes, &c., appear rising out of a forest of the most unsightly weeds.

Say, now all ye admirers of the arts, will ye make no general effort to eradicate the latter, and obtain the former effect? The former is surely to be wished for, and the latter appearance every person of the least judgement must despise. To the writer, it appears quite evident that no individual, however excellent his plans, or disinterested his motives, can perform such a work alone, but he is not without hopes, alth6' the evil is a great one, if every one who may desire the accomplishment of the object will do what he can, that the progress of these anti-embellishers may be soon arrested, and, *ultimately*, if not a sublime, at least a decent appearance may be produced and retained.

I propose, therefore, that a society should be formed for improving the appearance of this great city, and for the prevention of the increase of all unsightly objects and dangerous erections above the roofs.

In order to accomplish the formation of such a society, permit me, Mr. Editor, to solicit your aid, and through you I would solicit the aid of the press generally, and of every individual of refined taste.

I have seen some, and there are probably several houses which I have not noticed, both ancient and modern, both high and low, amongst the rich and the poor, with long chimneys and short ones, in different parts of London and the country, which have none of these most unsightly excrescences upon them. I, therefore, conclude, that if twenty houses can be built without having smoky chimneys, or unsightly terminations, so may twenty thousand. Now, I think that a careful examination and comparison of a great number of existing chimneys in all sorts of situations and weather, would lead to some most useful information. Such information ought to be the first object of the society which I now propose: and in this way, I think, it may be established as a fact, that there is now so considerable a number of chimneys in a great variety of situations which have no need of being *topped by the tinker*, that it may be proved the majority of other chimneys receive no benefit whatever from their frightful terminations, which cannot be more easily obtained by better forms and other means, out of sight.

Individuals cannot, but a society might, build chimneys, and make other experiments, to prove the degree in which one form is preferable to another —indeed, this, perhaps, ought to be done by the nation, and the merit of every contrivance investigated; as well as the several circumstances which are supposed to influence or retard the exit of smoke.

In these operations, instruments may be used to mark the differences with the greatest nicety.

Although I propose the society for London, its operation need not be confined

fined to the metropolis; for not only here, but, perhaps, in every part of the country, both in towns and on detached houses, these blots on architecture abound. Even noblemen of acknowledged discernment have submitted to have their most splendid country mansions disfigured by "tall boy" terminations to their chimneys, while, in some cases, their town mansions are without.

I trust, Mr. Editor, you will assist in recommending such an investigation as I have ventured to suggest; and, by the way, if Mr. Loudon were to introduce the subject into his work, it might do good; I am sure that he would not like to see his designs disfigured by "tees" and "tall boys."

Hoping this communication will not be useless,

I am, Sir,
Your obedient servant,
C. D. S.

[We do not know that we can do more at present than earnestly recommend the subject of this letter to the attention of our readers. Perhaps if there were an Institution of Architects, as there is of Engineers—or, to mark the distinction we have in view more completely, say of *Builders*—all the good that our correspondent anticipates from a public association for the improvement of the art of housebuilding might be accomplished. The builders are both a numerous and opulent body, and not a few of them distinguished for their public spirit and love of improvement. Should, however, such an Institution be established, its utility will be small, unless it is conducted on a principle of greater publicity, and with a steadier regard to specific objects, than the kindred association to which we have just alluded.—Ed. M. M.]

FUTILITY OF SCHEMES FOR OBTAINING MECHANICAL POWER BY CONVEYING AIR TO A DISTANCE THROUGH TUBES.

(From the Frankin Journal for March, 1832.)

Dr. Robison, in his third volume of Mechanical Philosophy, gives an account of an attempt made by Dr. Papin to use condensed air as a mechanical power. *The failure was complete*: I propose to *investigate the cause.*

He proposed to raise water out of a mine by a water power at the distance of a mile from the mine. He employed the water to drive a piston which should compress the air in a cylinder communicating, by a long pipe, with another cylinder at the mouth of the mine. He expected that as soon as the piston at the water-power had compressed the air to a certain extent in the tube, it would rush into the cylinder at the mine, force up its piston, and thus work the pump, discharging the water from the mine.

The machine, however, would not work; and, as he attributed the failure to the immense quantity of air in the tube, he diminished the diameter of the tube, and arranged his water-power so as to exhaust the air, believing that the immense velocity with which air rushes into a vacuum, would make a rapid and effectual communication of power. But he was entirely disappointed in this arrangement, as he was in the other. Experiments of this kind were made both in Westphalia and Auvergne.

Notwithstanding this failure was complete, an engineer, many years afterwards, "erected a machine in Wales at a powerful fall of water, which worked a set of cylinder bellows, the blow-pipe of which was conducted to the distance of a mile and a half, when it was applied to a blast furnace. But, although care was taken to make the conducting-pipe completely air-tight, of great size, and as smooth as possible, it would hardly blow out a candle. The failure was ascribed to the impossibility of making the pipe air-tight. But what was surprising, above ten minutes elapsed after the actions of the pistons in the bellows before the least wind could be perceived at the end of the pipe; whereas the engineer expected an interval of six seconds only."

"If we take a particular case, and calculate the resistance of air moving through pipes according to acknowledged principles, we shall find that there is nothing mysterious in the above result.

It will be found, that if the blow-pipe is three inches in diameter, and only a mile long, the air at one end must be kept constantly condensed by a pressure equal to $5\frac{4}{10}$ atmospheres, to produce a velocity of 128 feet per second. And yet this velocity gives only 2,304 gallons

per minute, only about half the quantity used in the furnaces of Europe; for, according to Dr. Robison, a blast furnace there expels 720 cubic feet of air per minute. (Mechanical Philosophy, vol. 8, p. 784.)

If we calculate the velocity of water issuing from a pipe, one mile long and three inches in diameter, under a nine feet head and fall, it will be found to be one foot per second.

Now, as equal velocities are generated in all fluids by equal heads, all other circumstances being equal, it will follow that a nine-foot head of air or one eight-hundredth of a head of nine feet of water, will generate in air, a velocity of one foot per second in a tube three inches in diameter and one mile long.

Again, it is known, both from theory and experiment, that the heads of pressure generating velocity in fluids, are as the squares of the velocities. Now, the square of one is one, and the square of 128 is 16384, therefore the head of pressure due to the velocity of 128 feet per second, is obtained by the following proportion as 1 : 16384 :: 9 to 147456; and this number, divided by 800, gives 184$\frac{1}{2}$, equal to a pressure of 5$\frac{4}{5}$ atmospheres, as was said above. Now, if suppose this velocity doubled, or 256 feet a second, in order to discharge air enough to supply a blast furnace, the head of the pressure will be four times as great, or upwards of twenty-one atmospheres. This would require a machine equal to 3426 horse-power, provided a horse can work eight hours a-day to raise 140 pounds, 200 feet per minute. Perhaps it may be thought that the great pressure on the inside of the tube will still further increase the resistance; such, however, is not the fact, for it is known that the same quantity of water will be discharged through a curved tube under a given head, whether the curve is vertical or horizontal; thus proving that the increased pressure when the curve is vertical does not increase the resistance. Indeed, the diminished velocity which results from increased density in the tube would indicate from theory a diminished resistance.

The precise effect of increased density and diminished velocity, I shall discuss at some future occasion. Enough has been said to show that it is utterly vain to attempt to transmit mechanical power to any great distance through pipes by means of air.

OBSERVER.

ERRORS IN POINTING.

Sir,—The most difficult part by far of the art of printing well, is that which consists in giving point to the meaning of an author; or, to speak more properly, in giving to an author's meaning all the point which belongs to it. To be a good reader (which I need not tell you, is the trade name for the corrector of the press), one must be a very clever fellow. I am almost inclined to say of readers as Macpherson did of translators, that no man can read proofs well, who could not himself write something as good as any thing he reads. The nicety of discrimination—the insight into the innermost depths of human thought—which are requisite to good reading, are only to be conceived by such as have been stultified beyond redemption, by the omission of a point of interrogation, or condemned to expiate at the end of a halter, the misplacing of a *dead stop*. Authors themselves are seldom good pointers; they are so familiar with their own meaning, that they fancy it must be equally clear to every one else without any help to the eye whatever; and it is only when they get a rap on the sconce in the shape of an ex-officio or true bill, that they are awakened to a due sense of the importance of having a scholar and a genius—a reader perfect *in all points*, to guide them to the *point of admiration!*

I have been led into these reflections from perusing some Cantos of Childe Harold contained in the last volume of the new edition of Byron's Works, which is in the course of publication by Mr. Murray. It comes from a good press—that of Messrs. Spottiswoode—it is edited by a gentleman intimately acquainted with the press, Mr. Moore—and it has been printed (it is to be presumed) from copies of the work revised by the noble and lamented bard himself. Yet, sooth to say, the errors in pointing in the Cantos before me, are not only, beyond all patience, numerous, but frequently such as to make sad havoc with the meaning of the author. Take an example or two:—

"Oh! where Dodona! is thine aged grove
Prophetic fount and oracle divine?
What valley echoed the response of Jove?
What trace remaineth of the Thunderer's shrine
All, all forgotten—and shall man repine
That his frail bonds to fleeting life are broke?"
Canto 11, Stanza 53.

Such is the passage, as printed and pointed in the edition before me. But, were justice done to the sense, it should stand thus:—

Oh! where Dodona! is thine aged grove?
Prophetic fount and oracle divine!
What valley echoed the response of Jove?
What trace remaineth of the Thunderer's shrine?
All, all forgotten. And shall man repine
That his frail bonds to fleeting life are broke?

Again:

"And therefore did he take a trusty band
To traverse Acarnania's forest wide.
In war well-season'd and with labours tanned
Till he did greet white Achelous' tide
And from his further bank Ætolia's worlds espied."
Canto 11, Stanza 19.

Here the period is placed at the end of the second of these lines instead of the third; and by this blunder, it is Lord Byron who is represented as seasoned and tanned instead of his Suliote guard.

One example more, and I have done:—

Beneath these battlements, within those walls
Power dwelt amidst her passions; in proud state
Each robber chief upheld his armed halls
Doing his evil will, nor less elate
Than mightier heroes of a longer date.
What want these outlaws, conquerors should have?
But History's purchased page to call them great?
A wider space, an ornamented grave?
Their hopes were not less warm, their souls were full as brave.

Canto 3, Stanza 48.

We have here two points of interrogation more than enough; what was meant for an answer is converted into a couple of additional questions; and by this distortion of the poet's meaning, both sense and melody are sufferers.

I have not an opportunity of comparing the present edition with any of those published during Lord Byron's life, in order to ascertain whether those and other blunders are peculiar to the former or not. But be this as it may, it is little to the credit of his surviving friend and editor, that he should have allowed so noble a text to be so abominably disfigured.

I am, Sir,
Your obedient servant,
A RETIRED READER.

Caloric from Water.—It is a known that a mixture of two parts of oxygen gas, and of one of hydrogen, (the initial temperature being communicated to it), will inflame, and develope sufficient caloric to burn the diamond. It is also known, that, by means of a voltaic battery, to each pole of which is united a thread of platina, the electric fluid, being forced to enter a glass tube full of water, produces a development of gas in both the ends of the tube, that connected with the negative pole being hydrogen gas, and double in quantity to that produced by the positive pole, which is oxygen. Now, my query is, may not an apparatus similar to that of the voltaic pile, or some other mechanism, be found, which, acting on a mass of water, may decompose it; and may not the oxygen and hydrogen gas, thus disengaged, be collected in immense receivers; some (those for the hydrogen gas) double the size of the others (for the oxygen gas); thus procuring for any one, economically and at will, in any part of the earth, volumes of combustible materials and (comburente) eminently calorific? — *Luigi Manetti: Gardener's Magazine.*

How to make a fine Blue for Artists from Indigo.—The blue vat of the dyer contains indigo deoxidised by protoxide of iron, and rendered soluble in its yellow green state by lime-water. If a portion of this solution be exposed to the air in a shallow vessel, the indigo will speedily absorb oxygen, and be precipitated in its usual state of an insoluble blue powder. This being dried and digested, becomes pure indigo, by the abstraction of all the resin and lime contained in it. Thus prepared, it is a fine powder, intensely deep, but softened, tender in its tint, resembling ultramarine, and does not change when exposed to the air; it is, therefore, an acquisition to the palette of no ordinary kind, and is likely to prove the most valuable of all blues when made into cakes for wash-drawings for the use of miniature-painters.—*Mr. Joshua Shaw: Franklin Journal.*

Mr. Beamish's New Mode of constructing Vessels (see Mech. Mag. vol. xvi. p. 119) has just undergone a very satisfactory trial at Portsmouth. The *Emerald* tender, said to be the fastest cutter in his Majesty's service, was ordered by the Lords Commissioners of the Admiralty to try its sailing qualities against Mr. Beamish's *Paddy from Cork*, for three successive days. Admiral Sir Thomas *Foley superintended* the match, and Captains Hyde *Parker and Hastings acted* as umpires. On the *first day (13th July)* the whole distance sailed was *25 miles, and the Paddy* beat the *Emerald* by nearly two miles; showing a superiority chiefly in running and reaching. On the second day the wind was blowing from the westward, and it being desirable to ascertain the *Paddy's* powers in windward sailing and in a sea way, the Beacon buoy of the Shingles, at the south-western extremity of the Needles passage, was fixed upon by the umpires, up to which the vessels were to beat. When the *Paddy* entered the Needles passage, the *Emerald* was nearly 2 miles astern of her. At 2 hours and 56 minutes she passed the Beacon of the Shingles, and hove to. The *Emerald* did not weather the same point until 3 hours, 7 minutes, and 30 seconds, being a difference of eleven minutes and a half in a dead beat to windward of 21 miles. Mr. Beamish's vessel having thus shown a decided superiority in every point of sailing, the umpires considered it unnecessary that the trial should be further extended.

A Patent Medicine Man.—In a late batch of American patents, we observe one to a certain Joseph Baker, for "an improvement in medicine;" which shows, that in America as elsewhere, ignorance and quackery go ever hand in hand. The following are literal extracts from this mountebank's specification of his precious "improvement." A mode of *preparing* and compounding medicine for an emetic, and *al so* to *cous* a free *per spiration* to be administered in diseases *coused* by cold and *ob structed per spiration*, such as *fevurs*, *rumatia*, dysentery, dropsy, *consumtion*, *pleuricys*, boldheves (?) and all stagnated complaints, with some others." * * "When the violence the *diseus requiers* a speady *remady*, and Nature calls for an emetic," &c. "give a dose of powders of the whole *compasition*" ("*sinaca* snake root,' "*sulfer*" "*brim stone pul ferised*," &c. &c.) "But, let it be well remembered that Nature is the *Grand Phesition*, and *wee* are only to assist her in *removeing* the *ob structions* that *is* found in her way as far as is in our power, and that *whe* should pay *petickler atention* to her *clames*, and try to supply her wants if *posable*!!!"

Mr. Busby's Apparatus for heating the interior of buildings by the circulation of hot water at any distance *below* as well as above the level of the fire (see Mech. Mag. No. 466)—an object not heretofore accomplished—underwent a very satisfactory trial at Mr. Eckstein's manufactory, Holborn, on Thursday last, in the presence of a number of engineers and gentlemen of science. In the present instance the heated particles of water circulated to a distance of 21 feet from the furnace; and there appeared no reason to doubt that it might be carried to any required extent.

INTERIM NOTICES.

We have forwarded D. W. C.'s letter to the first of the Societies of which he makes mention; the second is extinct.

A "Subscriber," who sent some time ago a design for heating steam-boilers by lamps, is requested to consult our 278th Number.

Mr. Rough should apply at once to the Humane Society.

A "Young American" will find the process of dissolving caoutchouc described in No. 396.

"Matter of Fact," in answer to a Practical Engineer" on the subject of Mr. Brown's engine, did not reach us till we were on the point of going to press. It is, therefore, necessarily deferred till next week.

Communications received from Mr. Deacon—An Old Mechanic and Subscriber at Manchester—P. H. Y.—Tyrone—Thoughtful.

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No. 471.] SATURDAY, AUGUST 18, 1832. [Price 3d.

CRAIGHALL COAL MINE MACHINERY.

Fig. 1.

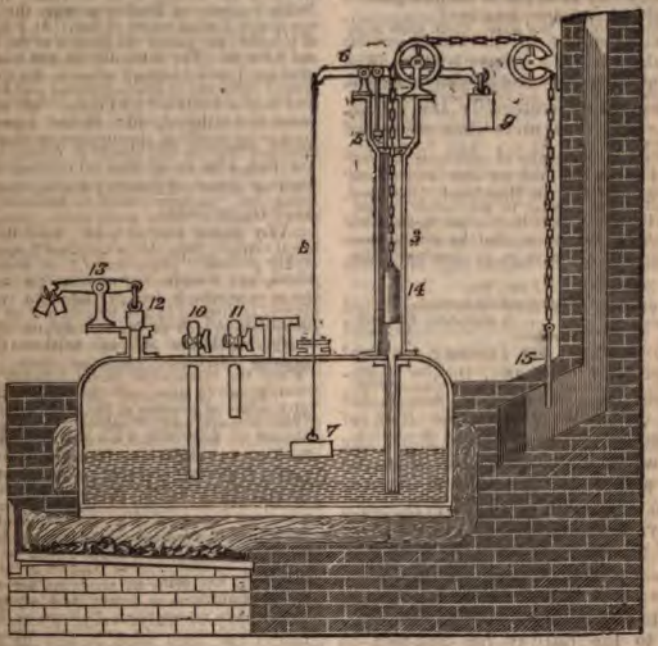
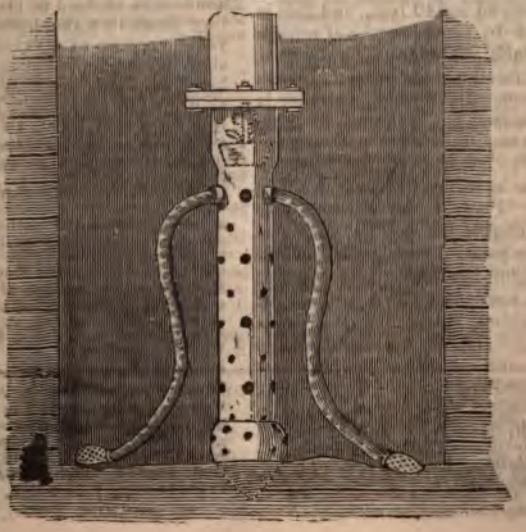


Fig. 2.



MILNE'S "PRACTICAL VIEW OF THE STEAM ENGINE."*

This is in many respects one of the most remarkable of all the books which the steam-engine has yet produced. It is equal to any of them in point of sound practical information, and is distinguished by a splendour of illustration which leaves them all at a great distance. The book may be considered indeed rather as a letter-press appendage to the plates, than the plates as mere illustrations of the book. Mr. Milne has not only chosen for his text-theme the largest engine ever erected in Scotland, but presented us with plates of these engines on a much larger scale than was ever before attempted in engravings of steam engine machinery.

The engine described was constructed in 1827 by Messrs. Claud, Girdwood, and Co., of Glasgow, for draining the coal mines of New Craighall, in the neighbourhood of Edinburgh, which are worked on a lease from the Earl of Wemyss, by Sir John Hope, Bart., the owner of an extensive coal-field immediately adjacent. The mine is situated close to the Edinburgh and Dalkeith Railway, and an inclined plane leads from the surface down to the bottom of the mine, where the waggons are loaded, and then raised up the incline by means of steam power, to be afterwards transferred to the railway for transport to Edinburgh. The depth from which the water is pumped is 540 feet, and this is accomplished by three lengths of pumps of 180 feet each. The engine employed is what is termed a three-valved, or single-acting one. Its working cylinder is 80 in. in diameter, and its piston can perform 13 eight-feet strokes per minute. Mr. Milne has given us two admirable views of this immense engine; each ꝯ feet by ꝯ. Plate I. is a perspective view of the engine with all its parts exhibited in the position they assume when the steam piston has reached its greatest height, the condenser-valve is opened, and every thing ready for the down stroke. Plate II. is an orthographic representation, in which the parts appear exactly as they are when the piston is at its lowest depression, and the lower or steam-reversing valve is open, and every thing ready for the commencement of the up-stroke. From the large scale on which these plates are executed every part is represented so clearly, as to render any explanation of them next to superfluous for practical men: but, for the sake of persons who may not be familiar with the subject, Mr. Milne has given a most minute description of the whole engine, and its modes of operation, with two or three additional engravings of detached portions.

We shall extract, by way of specimen, his account of a very efficient method by which the boilers are always kept supplied with just the requisite quantity of water, and no more. The "Fig. 1, Plate 3," of which he here speaks, will be found on our front page.

"This is secured in each boiler by causing the elementary water of the steam to descend with the pipe F, Plate 3, Fig. 1, which reaches to near the bottom of the boiler; and the statical weight of the fluid being greater than the expansive force of the steam, it finds its way into the boiler; and that neither too little nor too much may enter it, proper methods are adopted. The first of these inconveniences is prevented by a plentiful supply of water being pumped to the top of the feed pipe 3, and by a proper arrangement at that place, the superabundance of fluid is prevented from getting down into the boiler. This contrivance consists of a valve 5, which, when shut, prevents the entrance of the water; but if the fluid in the boiler should subside, by the generation of steam till below its proper level, this valve is opened just as much as is necessary to admit of a sufficient supply of fluid, which is effected by the valve 5 being attached to the lever 6, from which is suspended a stone 7, within the boiler, by the wire 8 passing steam-tight through the top of that vessel; the stone is balanced in the water by the weight 9; so that if the water subside in the boiler, the stone will preponderate, and thereby opening the valve, permit a greater flow of the fluid; which, accumulating in the boiler again, buoys up the stone, thus closing the valve, just as much as is necessary to admit of a proper supply of water for the generation of steam, &c. In addition to these precautions and adjustments for the regular supply of water, there is another

* A Practical View of the Steam-Engine, Illustrated by Engravings of the largest Machine in Scotland, Constructed by Messrs. Claud, Girdwood, and Co. for the Coal Mines of Sir John Hope, of Craighall, Bart., &c. By John Milne, Teacher of *Architectural and* Mechanical Drawing. 177 pp., *8vo. Edin. Balfour and Co.*

piece of mechanism for discovering whether the former be doing their office, which is known by opening the guage-cocks, 10 and 11; the pipe of one of these stretches down near to the bottom of the boiler; from which, when there is any expansive force of steam (*i. e.* a force above the pressure of the atmosphere), within, water is ejected by opening the cock, which indicates that the fluid in the boiler is still higher than the under-orifice of this pipe: on the other hand, if too much water has accumulated, it is known by opening the other stop-cock, which only stretches down near to the ordinary surface of the water; hence while every thing is performing its proper functions, on opening this stop-cock, steam issues from it; but if the fluid has covered the under-orifice of this pipe, water is ejected, thereby indicating that too much is getting into the boiler. It has been stated that the expansive force of steam within the boiler is prevented from blowing out the water by the feed-pipe; this is secured by a safety-valve 12, allowing the escape of steam before its expansive force is capable of making the water ascend to the top of the pipe 3. This valve consists of a pipe, communicating with the steam and the open air, and having a metallic stopper fitted into its external orifice; which stopper is a portion of a cone, having its apex turned towards the inside of the boiler; and it is so adjusted in weight, that in all cases it is pressed up by the steam before water can be pressed to the top of the pipe 3. In order to illustrate this, let us find by calculation the force of steam necessary to raise water in the boiler to the top of the feed-pipe. The top of the pipe is 10 feet 6 inches above the surface of water in the boiler; then 33·9 feet : 14·5lbs. :: 10 feet 5 inches 4·545lbs. the statical weight of water in the pipe per square inch of its area—equal also to the pressure of steam necessary to raise water to the top of the feed-pipe; and in order to prevent water from being pushed out, the safety-valve is made a little lighter than the statical weight of the fluid. Thus if the feed-pipe could admit of only 4lbs. pressure of steam per inch, then must the safety-valve be in weight, for each inch of its area, equal to 4lbs.; hence if its area were 5 square inches, 5 × 4=20lbs. the weight of the valve; which, however, for reasons already stated, should be made 2lbs. less. But as it is necessary to employ a greater or a less force of steam, according to the nature of the work in which the machine may be employed,* the mechanists have made this valve sufficiently heavy to admit of 4·5lbs. pressure per inch within the boiler; and by attaching the valve to a lever 13, and by hanging small weights at its opposite end, the valve can be adjusted by the use of one or more of these weights to any expansive force of steam necessary to perform the work required; but lest an inattentive superintendent should make the fire too strong, and thereby cause a waste of steam, by its escaping at this safety-valve, a contrivance similar to the one last mentioned is adopted. It consists of a float 14, suspended within the feed-pipe; which float rises or falls according as the steam may exert a greater or a less force within the boiler; for when the steam exerts a great pressure, a part of the fluid is caused to ascend within the feed-pipe; which floating up the hollow body 14, causes the damper to close the flue 15, which leads from the fire to the chimney, and the draught being thereby in part intercepted, the fire becomes less strong, and the expansive force of steam reduced; when, on the other hand, the water, together with the float, sinks, the damper is raised till the temperature of the fire, and consequent expansive force of the steam, become nearly equal to the weight of the safety-valve."—pp. 38--46.

We may, with advantage to our mining readers, add to this example of Mr. Milne's descriptive powers, his account of the method adopted in Scotland for preventing the choking of the pumps as the boring or excavation proceeds:

"In sinking an engine-pit, the pump must descend as the well becomes deeper; but where the strata are soft, the pump cannot be rested on the bottom of the mine, by which it would be liable to be choked at every stroke of the engine. The method adopted at Newcastle, and in its neighbourhood, is to hang the whole column of descending pumps in ropes; a practice not always efficient, as the stretching of the ropes allows the pumps to touch the bottom, by which they are rendered useless. Another plan has been resorted to in the same district, which consists in resting the columns of descending pipes upon beams of wood, placed at a considerable height above the bottom of the pit; and the under part of the pump is made capable of lengthening out like a telescope, while the under extremity of the pump is bent like the letter

* "The engine is *at present (1828)* employed in *pumping water from the pit in* progress of sinking; and the weight of water in the pumps thereby continually increasing, it may be found necessary to employ the full expansive force of steam, which, from the height of the feed-pipe, cannot exceed 4,545lbs."

L; and this part can be turned into the pools of water, by which they are drawn up into the pump. This contrivance is found to be effective; but it is not free from inconveniences. The miners in Midlothian think that the materials through which they pass are sufficiently hard to resist the weight of their pumps, which rest upon the bottom of the pipe. This has been successfully practised in the engine-pit at New Craighall, where the pump, including water, is about 3½ tons weight. The under end of this pump is pear-shaped, as in Plate III, Fig. 7;* having its under end close, while a number of holes perforate the metal to the height of 8 feet; these holes are made impervious to the passage of air by plugs of wood, which can be taken out when required. From this arrangement, should the pump sink into a soft stratum, even to 4 or 5 feet, the miners have only to pull out one or more of the plugs that may be immersed in the water; hence the pump can never be choked. In addition to the plan just described, Mr. Geo. Grieve, superintendent of works at New Craighall, has appended a piece of mechanism for reducing the pools of water. The contrivance consists of a leathern pipe, which is kept distended by spiral wires; and on end of this pipe being inserted into a plug-hole in the barrel of the pump, the apparatus is ready for action; and when the workmen wish to reduce any of the pools of water, they plunge the disengaged end of this flexible tube into the fluid; on which it instantly vanishes, being received up into the pump."—P. 142.

Mr. Milne calculates that the engine raises 4,900,896lbs. of water one foot high per minute; which, divided by 32,000, Mr. Watt's equivalent for the power of one horse, makes the power of the engine equal to that of 153·153 horses. The quantity of fuel consumed had not, however, at the time Mr. Milne wrote, been accurately ascertained. We regret that we are, therefore, unable to contrast the work of this "largest engine in Scotland," with those in Cornwall on Mr. Wolf's principle; for in the reports of the performances of the latter, the quantity of coals, and not the time, consumed in raising the water one foot high, is adopted as the standard of value. With respect to the extraordinary performances reported of Mr. Wolf's engines, Mr. Milne however suggests some doubts, *which we think* well deserving of being cleared up, and shall therefore lay them before our readers. In some of the monthly reports of the Messrs. Leans, it is stated that Mr. Wolf's engine at Wheal Vor lifted 47,900,333 lbs. of water, and his other engine at Wheal Abraham, 47,622,040 lbs, one foot high for each bushel of coals consumed. On this Mr. Milne remarks:

"In the experiments here detailed, it is not improbable that the valves of Mr. Wolf's pump piston were incapable of shutting completely, or that water escaped by the side of the working-box, or that the speed was such as to prevent the water following the piston, in either of which cases a very fallacious result would be obtained—by multiplying the capacity of the pump at the working part by the number of strokes in a given time, and assigning their product to the quantity of water discharged; indeed it is impossible to account for the great apparent superiority of the method employed at Weal Vor for generating steam, without assigning some other cause of error in the experiments. In experiments conducted by Messrs. De Prony and Mallet, by order of the French government, to ascertain the relative economy of fuel in two pumping-engines near Paris, one of which was a common condensing-engine, and the other on Mr. Wolf's plan, and both raising water from the river Seine into the same reservoir, they found an advantage of about 12 per cent. in Wolf's engine, when it was worked at its most favourable velocity; but a disadvantage when it worked quicker. It raised more water into the reservoir when working at 16 strokes per minute than it did when making 21. In these experiments the effect was not calculated by the number of strokes multiplied by the capacity of the pump, but was measured by the actual quantity of water discharged."

Mr. Milne has, in addition to describing the Craighall engine, devoted a considerable number of pages to a general examination of the agents employed in the action of a steam-engine. In treating of the "Weight of the Atmosphere," he gives the following interesting account of some original experiments made by himself, to ascertain the effects produced on the human body by a diminution of the ordinary pressure:

"On the 7th of April, 1827, a strong wooden box, covered with sheet lead, and having a plate of cast iron from its bottom, and whose capacity was 1433 cubic feet, was placed upon a table. The

* *Fig. 2 of our front page.*

author of this work placed himself, together with the subject of the experiment, within this receiver, and the whole was made air-tight, with a lute of strong clay. A glass tube communicated with the inside of the box, while its under orifice was immersed in a cup of mercury that rested upon the floor. During these adjustments, the person within breathed the external air by a lateral pipe, which communicated with the outside of the receiver; but when the air-pump was about to be employed, he shut up this pipe with a cylindrical piece of wood, having only a needle-hole pierced in the centre of this wooden stopper; air was then pumped out of the receiver, till the mercury rose in the glass tube to 7½ inches above the surface of that in the cup. The pulse, before exhaustion commenced, was 79 per minute; but after being an hour within the receiver, it fell to 65. But on the air-pump being stopped, the pulse appeared to be accelerated reciprocally to the deterioration of the air by breathing within the receiver. The time of this experiment was two hours; during which a constant but small supply of fresh air rushed into the receiver by the before-mentioned needle-hole.

"April 8th.—The mercury rose to 16½ inches; pulse fell 77 to 63. When exhaustion was at its maximum, the person, within the receiver, was very warm, but after attenuation of the air had been kept up about an hour, he became very sensibly cold. Experienced no difficulty in breathing until the air-pump ceased, on which the pulse was greatly accelerated, and the lungs shivered (if he may use the expression) and felt uneasy, which was an inducement to admit air rather too fast, on which his ears were much pained, and his eyes gushed with water. Time of this experiment was three hours.

"April 14th.—The rarefaction of the air supported a column of mercury 14 inches in height. Feelings produced were the same as on the last occasion. Experienced no difficulty in breathing till the air-pump stopped working; and the air being allowed to enter the receiver slowly, all disagreeable feelings were prevented.

"There were made many subsequent experiments of the same nature, and uniformly the same effects were produced. During one of these, however, when the mercury had risen to about 12 inches, the external air forced a little of the clay lute into the receiver with a loud noise; the person within immediately conceived that a jet of very warm water was projected against his body, and the inside of the receiver was, during the influx of air, perfectly illuminated, and he distinctly perceived the circular ribs which supported the inside of the box in which he was placed; but the light became less and less distinct as the receiver became filled with air. Towards the termination of this influx of air, the experimenters felt as if they were forcibly plugged with wood, together with a strong but short feeling of suffocation, and his eyes also gushed with water, disagreeable feelings which subsided when the receiver was again considerably exhausted.

"The cause of heat during the influx of air cannot be satisfactorily explained by the author, unless it be admitted that the sudden pressure of air on the body would cause a corresponding celerity of circulation of blood in the capillary vessels, and thereby excite the feeling of heat; for since the compressing force of the atmosphere was only six pounds, and which also continually decreased as the receiver became filled, and because the mass of attenuated air was about 12 cubic feet, while the area of the hole through which the air rushed was only half-an-inch, the process of condensation must have been too slow to produce the feeling of heat. It may be observed too, that although air, by sudden compression, will give out heat and light, yet, by rarefaction, it is known to produce cold; therefore, since the air that entered the box was increased in volume, it must have abstracted any heat that could have been generated, by its compressing the mass within the receiver. The fact of the box being illuminated, can be accounted for, by saying that the air carried along with it a portion of light, produced by two candles, which illuminated the room in which the experiment was made; for the moist particles of the winter's atmosphere being impregnated with the light, and flowing rapidly into the receiver, makes it almost certain that the appearance of light to the experimenter proceeded from this cause, and since vision was perfect, it was not likely that the idea of light was communicated by sudden pressure on the eye, and the area of the orifice, through which the air rushed, being only ·5 of an inch, and in the bottom of the receiver too, it is impossible that any direct rays of light from the candles could have entered it.

"This decrease in the number of systoles of the heart, is at variance with the experiments of aeronauts; but let it be remembered that the perturbation of mind inseparable from a knowledge of being suspended some thousand feet above the earth, would produce, without the inter-

vention of any other cause, an increase of pulsation. The effects produced by these experiments were also different from what was felt by M. de Saussure, while on the summit of Mont Blanc; the pulses of that gentleman, and of his two attendants, were, before ascending the mountain, only 40, 60, and 72; but, on its summit, they were 98, 112, and 100. But he has also said, that he has found the air to contain six times less humidity than that at Geneva, and also that he detected atmospheric acid in the surrounding medium. These, together with the fatigue induced by ascending a rugged mountain many thousand feet in height, and the burning thirst of which Saussure complains, was more than sufficient to effect the acceleration of the pulse felt by this philosopher. It may be remarked, that the corresponding height in the atmosphere where it would be attenuated so much that it would only support the mercury at 16½ inches in the barometrical tube, is situated at about 17000 feet above the level of the sea; while the height of Mont Blanc, among the highest mountains in the old world, is only 15,680 feet.

"This anomaly in effects produced by breathing attenuated air was an inducement to try its manner of operation on some other person. A stout young man was anxious to make the experiment. While he was in the receiver, the mercury rose to 11 inches; he felt no inconveniency from being so situated. A young girl too, wishing to know what was to be got within the box, was, at her own request, introduced: exhaustion supported a column of 9 inches. On being liberated, she did not complain of any thing but the hissing of the air-pump."

In an appendix to the work, Mr. Milne gives a description of a New Statical Mercurial Dynamometer, with an account of the results obtained by means of this instrument on the Kirkintulloch Railway. For this invention he received the honorary gold medal of the Highland Society; and very deservedly, for it is an instrument both of great ingenuity and much practical utility. We reserve an account of it for some future opportunity.

Before taking our leave, for the present, of Mr. Milne and his excellent work, we must mention that it is published both in English and French, each page of our mother tongue being translated on the opposite page into French. Mr. Milne's reason for this is, that "the *junior class of readers* in this and other countries may comprehend, in either language, the technicalities which belong to the subject." We do not think this, by any means, a sufficient reason for the double expense to which Mr. M. has thus put his English purchasers; and see but little utility in any point of view, in so departing from the usual course. Neither is the French version, by any means, a good one. In some instances the translator seems to have been sadly puzzled about the French "technicalities." In a note, p. 51, he says, "On a conserve la mot Anglais *tapet* pour exprimer les chevilles et tasseaux," &c., as if the French had not in their *tapecu* a term quite as distinct and significant as "la mot Anglais."

BROWN'S GAS VACUUM ENGINE.

Sir—In answer to A Practical Engineer, allow me to say, that Mr. Brown never asserted that his present plan of generating gas by coke ovens was peculiar to the generation of gas. Mr. Surrey and Mr. de Jongh may have succeeded in the same method of producing heat, and if that heat is sufficient for steam-engines, it is a pity their plan is not generally adopted. That it is not so after more than eight years' trial, makes me suspect that there must be some radical defect in it; but as I have not seen Mr. Surrey's invention, I will not follow your correspondent's example, who evidently has not seen Mr. Brown's, by arguing upon it.

Your correspondent asserts, that Mr. Brown states, as a fact, "that $\frac{1}{10}$th part, or 2½ per cent. of gas, in commixture with 97½ per cent. of atmospheric air will produce an explosive mixture." But this never was asserted by Mr. Brown. He states, that "1 cubic foot of gas will, on an average, produce (by inflammation, not by explosion) 40 feet of vacuum;" and this assertion is proved by the fact, that whatever may be the capacity of the cylinder (as far as experiments have hitherto been made) if its contents are divided by 40, the produce is the No. of feet of gas which will produce a vacuum in it, and raise the mercury to 24 inches. In the Beam engine, indeed, 46 feet of vacuum are produced by one foot of gas. That these assertions are facts, ocular demonstration will prove, in the engines at Eagle Lodge.

Your correspondent states the vacuum which one foot of *water* will produce. I presume he means when it is converted into *steam*. Now, Sir, we know that one bushel of coals will produce 8,000 feet of steam, and that 8000 feet of steam will produce 8,000 feet of vacuum. It is also admitted, that one bushel of coals will produce 350 feet of gas; and it is proved at Eagle Lodge, beyond contradiction, that 350 feet of gas produce 14,000 feet of vacuum. This will show how unfounded is his comparison between steam and gas.

In answer to his question, I will inform him, that 6 retorts, holding 2 bushels of coal each, will produce in 4 charges of 6 hours each, 16800 feet of gas, which will be sufficient to work the engine, stated to be a 10-horse power, 12 hours. This will be a conclusive answer to the assertion, that the Croydon engine consumes as much gas in 3 hours as its apparatus makes in 48; an ingenious conclusion, by-the-bye, when it is known to work on an average 2½ hours in 24.

In justice to that engine it must be stated, that though your correspondent, in opposition to the opinion of the first engineer of the day, asserts it to be only 5-horse power, yet that it does the same work as was previously done by a steam-engine said to be of 16-horse power. Your correspondent may be right in his assertion, that a coke oven will not produce a degree of heat which will generate steam with sufficient rapidity—and this *may* be the reason for the plan not being generally adopted. But I will again appeal to ocular demonstration to prove that the heat so produced is sufficient to generate gas from sea coal; and if he will name any day on which he will meet me to examine this fact, I pledge myself to prove it to him. I will only add that the pillar engine, to which only he alludes, never could be applied to navigation. That engine is adapted only to raising water to any height not exceeding about 14 feet; and for that purpose I fearlessly assert, that the best steam-engine that was ever constructed cannot be compared with it. Let him go to Eagle Lodge to see it—and he will then be more entitled than he now is to the appellation of a "Practical Engineer."

I say nothing of the panacea he alludes to; when the water gas apparatus, which he designates as such, is completed, it will speak for itself.

I am, Sir,
Your very humble servant,
MATTER OF FACT.

London, Aug. 9, 1832.

THE DIAK SWORDS.

Sir,—I am highly obliged to Ferrum, (page 294) for coming to my assistance with his cutting *ironical* defence of my gigantic adversary Junius Redivivus. He goes, however, too far in his satirical allusions to the Walby trowels: I am afraid the redoubted Junius will take so much to heart the rude sneers at his assertions as to the excellence of edge, possessed by those "enchanted weapons," as to discontinue his communications! I should be the less surprised at this, that I myself, Solomon Secundus to wit, before I discovered the real drift of my new ally's letter, felt so affronted at Ferrum's (apparent) questioning of my infallibility, that I had well-nigh determined to desert the Mechanics' Magazine in a huff: that being the only way left to your man of genius (like Junius or I) of punishing the Editor for daring to insert any communication opposed to sublime and incomprehensible views! However, I have recalled my determination, and that's enough! The pages of the Mechanics' Magazine shall continue to be illustrated by the lucubrations of Solomon Secundus! Nay, I will even condescend to accept the post of co-editor,—a post, Sir, which must be shared by a tolerably numerous body, if the rule is to apply generally, that every correspondent who offers strictures on the communication of another correspondent, is to be held to "know better than yourself what kind of contributors should find admission," and be installed co-editor accordingly. Ferrum himself will come in for a slice, and the M. M. office, I am afraid, will have to be enlarged for the reception of the numerous assailants of Saxula's locomotive theory!

To be a little more serious. Why is my attack on Junius Redivivus to be taken as an assumption of editorial power? Why are we continually threatened with a discontinuance of Junius's contributions, if a whisper is raised against the great Bashaw? Why is

"Ferrum" apparently so personally offended at my remarks? The answer to this last question, is, I opine, as plain as a pikestaff. The original Junius was in the habit of supporting his essays by letters in the same paper, *under a different signature:* it can pretty well be guessed who the modern "Man in the *Iron* Mask" really is,—and that, as the song says, "fully accounts for the same."

Ferrum's letter leaves the question just as it was; but I must protest against his assumption, that I believe all that Mr. Dalton tells us about the Diak swords. I give no opinion either one way or the other. All I contend for, is, that Junius rather confirms than invalidates his testimony; but that, after confirming it, he suddenly turns round, and without a why or a wherefore, pronounces the whole story, a falsehood; or, to use his own words, after asserting that Mr. Dalton's statement has "nothing remarkable in it," pronounces it a "superstitious story, savouring of enchanted weapons." This inconsistency cannot be got over: Ferrum, therefore, prudently says nothing about it, but confines himself to a very special-pleader-like defence of Junius's *ipse-dixit* on the chopping through of musket-barrels, and an attack on yourself, Mr. Editor, for daring to insert my former letter.

With respect to this same musket-barrel question, I do not see, if we believe all that Junius tells us, that Seljie's boast is so very improbable. He admits that a modern fowling-piece might be served so, but immediately excepts "a regulation musket-barrel—yet why? In Junius's first letter on the subject, it is intimated that any thing is thought "good enough for India;" musket-barrels, I suppose, as well as knife-blades. May we not, therefore, be allowed to suppose, that even a regulation-barrel might escape our contractors, almost as soft as a modern sporting-barrel? Besides, after all Junius's denials that the Diaks make better swords than ourselves, he tells us, that he has no doubt the "excellence of the Indian swords" arises from the practice of "cold-hammering;" that in England steel is principally wrought by rollers, the time of the workman being too valuable to bestow much upon it; but that in India, "whether the sword-blade be three weeks or six in making, is *matter of no calculation.*" Now, as he tells us, that an effect is produced by cold-hammering which *could not be* by rollers, is it unreasonable to suppose that the Diak swords may, after all, possess an edge superior to our own, or even capable of cutting in two a musket-barrel of the usual "exportation" character?*

As to the Runic smith, the applicability of lugging him in, is not attempted to be defended: Junius's making use of him twice would not be so ludicrous, if he had not shown his anxiety to introduce him by pulling him in, where he is quite out of place.

I remain, Sir,
Yours, &c.,
SOLOMON SECUNDUS.

INSTANTANEOUS LIGHT PROCURER

Dear Sir,—The following is a sketch of a simple instrument for obtaining a light. As the invention, though not new,† is, perhaps, not generally known, I shall be glad to see this description of it in your Magazine, if you think it worthy of a place.

Yours, respectfully,
E. J. MITCHELL.

Bradford, Yorkshire,
June 19, 1832.

Description.

AB is a brass cylinder, similar in appearance to a small brass cannon, having the hole rather better than 3-8ths of an inch in diameter, drilled true and clean rinsed.

CD is the form of a piston to work in the cylinder, but unpacked.

EF is the same, ready-packed with thick leather, and fitted up for use.

h is a circular brass nut, working against the screw *g*, to keep the packing tight.

* As Junius says: "The iron which he makes his steel from is doubtless of excellent quality, and the abundance of cold-hammering *does the rest.*"

† It is very well known on the Continent, by the name of the Instantaneous Light-giving Syringe. As it has not, however, been described in this work, and may be new to some of our readers, we insert our correspondent's description.

k is a small hook, fastened in a hole drilled through the nut *h*.

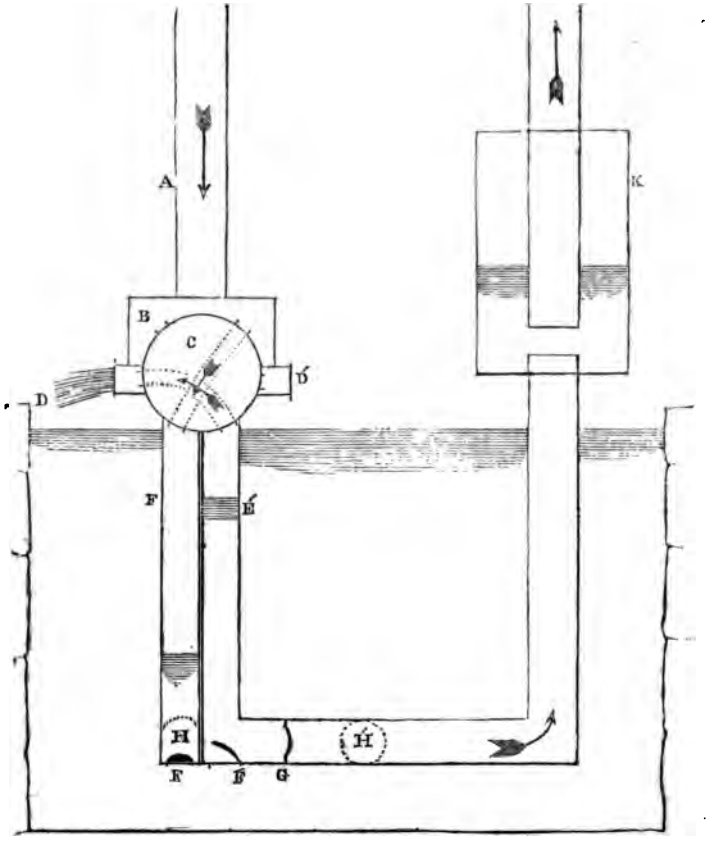
C is the handle to the piston, and made of wood.

Method of Use.

Prepare some thin cotton rag (older and thinner the better), by steeping it in a solution of saltpetre, and drying it in a warm oven; tear a small piece off, and place it on the hook K; introduce the piston EF into the cylinder AB a short distance only; then take the cylinder in the right hand, place it *perpendicular* upon the floor or a table, and strike the handle E of the piston EF with the ball of the right hand, so that the piston may rapidly descend to the bottom of AB, and being *suddenly* withdrawn, the tinder will be found on fire, and will light a common brimstone match. Amadou, or German tinder, which may be obtained at any of the principal druggists, is likewise a good tinder; but I prefer the rag steeped in saltpetre.

E. J. M.

PLAN FOR DRAINING AND VENTILATING MINES BY ONE APPARATUS.



Mr. Editor, — The accompanying sketch represents the principal parts of a contrivance for draining and ventilating mines by *the same* agency.

A is a pipe, descending from the surface to the bottom of the mine; a steam engine on the surface forces air into it to the required amount of pressure. B is

an air-tight chamber in which it terminates. B has two openings which are alternately put in communication with E or E′, water-pipes by the four-way cock C. C is a four-way cock having a straight and a curved passage, passing, but not intersecting each other, in the solid body of the cock. The straight passage, as before mentioned, establishes an alternate communication between the air-pipe A, and either of the water-pipes E, E′. The curved passage performs the same office for the water-pipes, and the air exits D and D′. K is the ascending water-pipe, with which E communicates directly, and E′ indirectly, by means of a pipe leaving it at H, and entering K at H′. The rest of the figure will explain itself.

The action represented is as follows: air is descending in A, and passes by the straight passage into E, where it is forcing the charge of water out of it through HH′ into K. Meanwhile water is ascending in E, following the charge of air which is escaping by the exit D, and which may be conducted thence through the mine.

I have already had the opinion of one of the leading philosophers of the day; he made one objection, which I shall state, in the hope that some of your friends may suggest a remedy. It is, that where the mine is deep the air will prove insufficient in two ways to perform the office assigned to it—viz. 1st. it will lose some of its elasticity; and next, it will suffer a large absorption by every successive portion of water it comes into contact with.

I am, Sir,
Your obedient servant,
Φ. M.

METHOD OF ASCERTAINING ANY INACCURACY IN THE FORMATION OF PIVOTS OF ASTRONOMICAL INSTRUMENTS, OR ANY SUBSEQUENT DERANGEMENTS OF THEIR TRUE SHAPE. BY LIEUTENANT PETER LECOUNT, F. R. A. S.

(From the Transactions of the Astronomical Society.)

In a paper read before this Society, March 13, 1829, I pointed out a minute error likely to arise in the use of transit instruments, &c., from the decomposition which would take place in the steel pivots, in consequence of the oil used becoming rancid, and forming with them *and their brass Y's the* galvanic circuit.

It being an established chemical fact, that this decomposition will take place under the above circumstances, a method of ascertaining whether any injury has taken place will perhaps be acceptable to the Society, particularly as the same instrument which will show a deterioration in a transit that has been used, will also, in a new one, detect any inaccuracy in the original formation of the pivots, and may in both cases be made to measure the amount.

Giving the true cylindrical shape to pivots is one among several points to which the German artists pay very considerable attention; and I have every reason to believe that the correctness of their workmanship is in a great degree owing to the means they use to counteract the effects of friction, flexure, and temperature, while the metals are undergoing their various processes during manufacture.

It was in the workshop of M. Repsold, of Hamburg, that the idea first suggested itself to me of ascertaining the existence of any errors in the shape of the pivots of instruments. I do not know what final measures M. Repsold may pursue for fully satisfying himself that he has counteracted any irregular expansion or alteration from flexure while his pivots are being turned in the lathe; but one step which he showed me was, that when the pivot, of about ¾ inch diameter, fixed to a brass circular block about 3 inches diameter and ½ inch thick, was put into a socket longer than itself, it rested on the compressed air; and while the socket was held in a vertical position, a light touch of the finger spun it round for upwards of a minute (no oil being used). This freedom of motion would alone form a very delicate test, especially when the depth to which the pivot sunk by compressing the air in the socket was observed before the motion was given it, and after the temperature of the metals had become equalised; for, on then putting it in motion, it should rise in the socket, if perfectly air-tight, from the friction expanding the contained air.

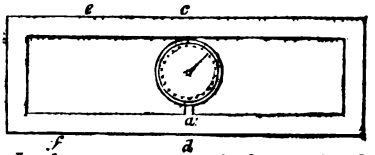
The instrument which M. Repsold showed me for detecting flexure was a series of inverted levers; and upon considering this, and Reichenbach's lever of contact, it appeared to me, that a wheel-pyrometer might be adapted for the purposes of both instruments with advantage,

it being capable of greater susceptibility, and having less friction among its parts; while, as a measure of the deviations of pivots, it would possess a greater accuracy than Reichenbach's lever of contact, for the same reason that it does over the old pyrometer on the lever construction.

A pyrometer on the wheel construction (the motion being, in the first instance, communicated by a rack), is simply a conversion of a rectilinear motion into a circular one, and may therefore be very advantageously made use of for measuring any other rectilinear motion within the range of the scale, as well as that produced by the expansion of metals; the circular motion producing any extent of accuracy which may be wished.

The one which I have, was constructed on my own plan, the diameter of the circular scale being $2\frac{1}{2}$ inches, and each division $= \frac{1}{65\frac{1}{72}}$ of an inch; and as the divisions are about $\frac{1}{15}$ of an inch apart, it is capable of being read off with ease to the $\frac{1}{1651\frac{1}{88}}$ of an inch. I am not aware that it possesses any peculiar accuracy beyond others: at all events, an equally good one can be constructed by any workman of common abilities. It may be as well to add, that it shows very sensibly the expansion of a brass rod 12 inches long and $\frac{1}{4}$ inch diameter by the warmth of the breath.

I first adapted it to exhibit the effects of flexure. For this purpose, I placed it between the two longest sides of a wrought-iron parallelogram, each of which is $9\frac{1}{2}$ inches in length and $\frac{1}{2}$ an inch square. The bending of these sides by the thumb and finger is shown by a motion of the index equal to $\frac{1}{5}$ the circumference of the scale, as in the following diagram, where *a* represents the rack, *b* the face of the pyrometer, and *c* and *d* the places where the pressure is applied.



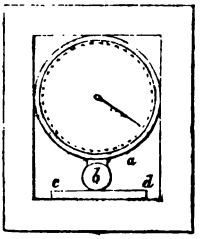
In the same manner, it shows a bending by the thumb and finger of the sides of a cast-iron parallelogram, 1 foot long, and $1\frac{1}{4}$ inches square, equal to $\frac{1}{60}$ of the circumference of the scale; and I consider it would render the same force sensible if the *sides of the parallelogram were 2¼ inches square.*

In a cast-iron parallelogram, if the thumb and finger are applied, as at *e* and *f*, one inch from the ends, a motion is produced in the index.

The mode of applying this instrument, in order to ascertain the flexure of any proposed body, with any given pressure, will require but little mechanical genius. As, however, each case will possess its own peculiarities, I presume it is unnecessary to enter into this part of the subject, as it would unavoidably lead to a considerable detail.

To adapt it to the examination of the pivots of astronomical instruments, or other cylindrical bodies, it must have a contrivance for back motion, which, in fact, it ought to have as a pyrometer. This is effected in my instrument by the centre pivot (which carries the index) winding up a small weight as the index revolves, which weight is therefore constantly acting on the train of wheels, and endeavouring to make them retrograde; and that a weight of a few grains may be sufficient (which it will be, if it only has to move the wheels), the rack is pushed outwards by a spring.

The instrument must be put in a strong frame, as shown in the annexed figure, where *a* is the rack-piece, and *b* the new pivot to be examined.



If we now suppose the rack pushed in to about $\frac{1}{3}$ its range, so as to admit the pivot, as shown in the figure, it is plain that, by turning the frame round the pivot, or the pivot round in the frame, any inequalities in its shape will be indicated by the scale; the amount will be shown by the value of the divisions, and the delicacy of the test will be governed by the powers of the instrument, which, with reference to practical results, are unlimited.

The end of the rack should be faced with hard polished steel, to prevent abrasion; and a similar piece of steel should be placed under the pivot, on the lower part of the frame (as at c d), so that the

rack-piece is exactly above it. If this piece of steel, and that at the end of the rack, are equally thick, the examination may be made on successive parallels of the pivot, from its shoulder to its end, each of which parallels will, of course, be equal in thickness to the facing at the end of the rack.

By a precisely similar method of proceeding, the effect of any deterioration will be discovered, after any length of time that the pivots have been in use, and the positions of a transit ascertained in which any respective errors from this cause will require correction. The peculiar circumstances of the case must alone determine the manner of applying this correction, the calculations for which may be rendered very simple.

It will, however, be more convenient to examine the pivot of a transit, while in its Y, without removing the transit instrument. In this case, the bottom of the frame before described is to be dispensed with; the two uprights are to be made with enlarged ends, to perform the office of feet; and the frame being placed on the pillar of the transit, so that the rack stands at a right angle with the axis of the pivot, a weight must be put on the top sufficient fully to ensure all motion taking place on the rack alone.

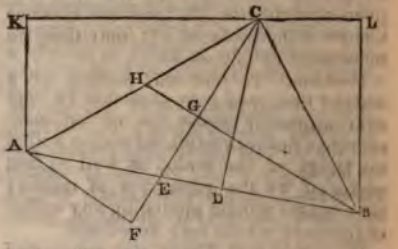
When a correct-made pivot is afterwards found to have altered its shape, it will not be very easy to ascertain what part of the deterioration is due to abrasion and what part to decomposition; but as the pivots are made of hard steel, almost all abrasion must necessarily take place on the brass Y's, while, as I have before shown, all decomposition will take place on the steel pivot.

MAXIMA AND MINIMA OF GEOMETRICAL QUANTITIES.

Sir, Dr. Gregory, in the last edition (10th) of the Woolwich Course, vol. i. has given nine new problems on the maxima and minima of geometrical quantities. The third of these, if I am not greatly deceived, is erroneously enunciated. It is as follows:—

"*Problem.* Let ABC be a right-angled triangle, of which AB is the hypothenuse. Draw through the angular point C a straight line, such that the sum of the two perpendiculars, let fall upon it *from A and B* respectively, shall be a *minimum.*"

Now, with profound deference to the superior acquirements of the ingenious Professor, I am inclined to believe that this problem does *not* admit of a minimum; provided always, that this postulate shall be granted, that a problem requires construction.



Let ABC be a triangle, right-angled at C; draw CD perpendicular to AB, and draw any straight line CGF intersecting AB in E; draw BG and AF perpendicular to CF. Then, when the point E is between A and D, the angle CEA is obtuse ∴ the point F will fall below the point E, and BG above it. Produce BG to meet AC in H; then by similar triangles CG : GH :: CF : AF, but CF > CG ∴ AF > HG; hence AF + BG > BH, and, consequently, much greater than BC. Now, as the point E moves nearer to A, the point G will approach to C; and when E coincides with A, then AF vanishes and the point G coincides with C. In the same way, if the point E moves from D to B, it may be demonstrated that the sum of the two perpendiculars AF + BG will be greater than AC. Hence is BC is less than AC, the problem will admit of a construction, provided the sum of the perpendiculars is greater than BC. If the sum of the perpendiculars should be equal to BC, then no line would require to be drawn.

The problem, however, admits of a *maximum*; for AF ∠ AE and BG ∠ BE ∴ AF + BG ∠ AB; but when the point E coincides with D, the points G and F will coincide with D. In this case, the sum of the perpendiculars will be equal to AB.

Again, suppose the line CGF to revolve into the position KCL, and let the angle KCA = ∠ ACF; draw AK, BL, perpendiculars to KL; then AF = AK; and because ACB is a right angle, the two angles KCA + BCL = a right angle ACF + GCB, and subtracting the equal angles KCA and ACF, there remains the

angle BCL = GCB, and each of the angles at G and L being right angles ∴ BG = BL; consequently, AF + BG = AK + BL.

If the sum of the two perpendiculars AF + BG, or AK + BL, be equal to a given straight line, the problem assumes a more difficult form. It may then be enunciated as follows:—

Problem. To find the position of a straight line drawn from or through the right angle of a right-angled triangle, such that the sum of the two perpendiculars let fall upon it from the two acute angles shall be equal to a given straight line: and discuss the limits of possibility.

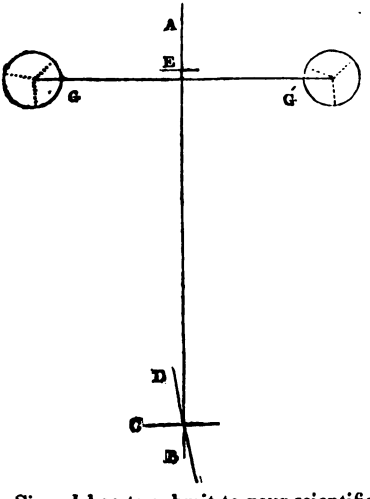
Any of your ingenious mathematical contributors who will give a solution of the above problem will great oblige your humble servant,

A LIEUTENANT OF ENGINEERS.

Jan. 23, 1832.

P. S. I may as well take this opportunity of pointing out to Dr. Gregory's attention that there is also an error in the second of these new problems, though evidently the result of mere oversight.

ACCURATE BALANCE.



Sir,—I beg to submit to your scientific readers, the prefixed plan of a delicate balance. GG is the balance, with an elongated axis AB. E is one of the fulcra, on which the axis plays by a knife edge. C is the other fulcrum, moveable, in a position parallel to itself, by a micrometer screw. D is the other knife edge, intersecting the axis at a small angle.

The use is as follows:—approximate to equilibrium, as nearly as convenient, by known weights; then complete the equilibrium by shifting the moveable fulcrum in or out, and the micrometer will register the progress, while the libration of the balance is never interrupted.

I am, Mr. Editor,
Your obedient servant,
Φ. M.

NEW ZEALAND AND TRISTAN D'ACUNHA.

A work has lately appeared,* which, from its title, appeared likely to be the most valuable of all the publications of the season, in the department of voyages and travels. The island of New Zealand, on many accounts, but especially from its proximity to the British settlements in New Holland, and the probable advantages of adding it to the number of our colonies, a measure which seems to be more than contemplated by the Australian Government, presents an interesting field of observation. We are sorry, however, we cannot give Mr. Earle the praise of having made the most of that field, for we take the truth to be, that the better part of the harvest yet remains to be gathered in, by some subsequent and more industrious literary husbandman. Mr. Earle's narrative is too much taken up with incident to the exclusion of information—and the history of the petty squabbles of savage chiefs (who, to mend the matter, appear to be *always* quarrelling).

Our author, it appears, has always led a life of wandering. Since the year 1815, he has visited the coasts of the Mediterranean, the United States, most parts of South America, Hindostan, Van Dieman's Land, and New South Wales, not to mention the two subjects of his present work. Nor has he been idle in his profession (which is that of a draughtsman, in

* A Narrative of a Nine Months' Residence in New Zealand in 1827, together with a Journal of a Residence in Tristan d'Acunha, an Island situated between South America and the Cape of Good Hope. By Augustus Earle. London, 1832. Longman and Co. 8vo. pp. 371.

which capacity he is now afloat in the *Beagle* discovery-ship), for it appears it is to him we are indebted for the original sketches of the magnificent panoramas of Sydney, Hobart Town, and Madras, which attracted so much attention a short time ago. We are afraid, indeed, that he is too much of an artist to make a good traveller. His eye is too much employed in search of the picturesque, to observe the useful—his hand too exclusively familiar with the pencil, to enable him to make much figure with the pen. His artist-like admiration of the forms of the New Zealanders, too, quite blinds him to the deformity of their deeds; and he is so prejudiced in their favour from outside appearance only, that after being convinced, from ocular demonstration, of their murderous and even cannibal propensities, he still owns a partiality for them! This partiality induces him to defend their numerous massacres of the crews of vessels which have touched upon their coast—(in which, however, he only follows in the wake of the Useful Knowledge Society*)—and to lay all the blame on the murdered instead of the murderers; all which is a sad waste of time and argument. If the space occupied by the re-reprinted account of the massacre of the crew of the *Boyd*, which, since its appearance in so well-known a work as "Constable's Miscellany," must certainly be pretty well-known, had been devoted to a sketch of the English establishments on the island, it would have been a great improvement. These are only mentioned incidentally, and then so very slightly, that we can hardly be said to catch even a glimpse of them; as in the following instance:—

"I found a respectable body of Scotch mechanics settled here, who came out in the New Zealand Company's ship *Rosanna*, and who determined to remain at Ko-ro-ra-di-ka. Their persevering industry as yet has been crowned with success, and they seem well pleased with the prospects before them.

"Here these hardy sons of Britain are employed in both carrying on, and instructing the wondering savage in, various branches of useful art. Here the smith has erected his forge, and his sooty mansion is crowded by curious natives, who voluntarily perform the hardest and most dirty work, and consider themselves fully recompensed by a sight of his mysterious labours, every portion of which fills them with astonishment. Here is heard daily the sound of the saw-pit, while piles of neat white plank appear arranged on the beach. These laborious and useful Scotchmen interfere with no one, and pursue successfully their industrious career, without either requiring or receiving any assistance from home."—P. 51.

It is wretched to find that shortly after this, the labours of this industrious colony were suspended, and their lives put in jeopardy, by one of the interminable wars of the "picturesque savages" whom Mr. Earle so highly admires. It is to be hoped that, ere this, measures have been taken by the Government of New South Wales to prevent a repetition of such an occurrence, by forming a regular establishment at New Zealand, protected by a garrison; indeed, some late accounts would lead us to believe that a proper settlement on the island has been already commenced. The importance of such a measure cannot be doubted; the cultivation of New Zealand flax seems likely to become an object of the first consequence; and the produce of the forests may be almost said to be essential to our navy. Why, then, not take possession at once of the whole island, turn its now useless pastures to account, civilize its handsome but barbarous natives, and transform them from "athletic savages" to "good tradesmen" and "useful members of society?" In a very few years, perhaps, we may see this picture realized! In the mean time, to the delight of Mr. Earle, let murder and cannibalism continue in all their glory, with all the mysteries of tabooing and tattooing, respecting a professor of which latter art we have an amusing notice:—

"The art of tattooing has been brought to such perfection here, that whenever we have seen a New Zealander whose skin is thus ornamented, we have admired him. It is looked upon as answering the same purposes as clothes. When a chief throws off his mats, he seems as proud of displaying the beautiful ornaments figured on his skin, as a first-rate exquisite is in exhibiting himself in his last fashionable attire. It is an essential part of warlike preparations. The whole of this district of Ko-ro-ra-di-ka was preparing for the

* In the (altogether) very interesting and excellent volume of the Library of Entertaining Knowledge, on "The New Zealanders."

approaching war. Their canoes, muskets, powder, and balls, increased daily; and a very ingenious artist, called Aranghie, arrived to carry on this important branch of his art, which was soon placed in requisition, for all the mighty men in the neighbourhood were, one by one, under his operating hands. He was considered by his countrymen a perfect master in the art of tattooing; indeed, so highly were his works esteemed, that I have seen many of his drawings exhibited even after death. A neighbour of mine very lately killed a chief who had been tattooed by Aranghie, and, appreciating the artist's work so highly, he skinned the chieftain's thighs, and covered his cartouch-box with it!

"I was astonished to see with what boldness and precision Aranghie drew his designs upon the skin, and what beautiful ornaments he produced; no rule and compass could be more exact than the lines and circles he formed. It was most gratifying to behold the respect these savages pay to the fine arts. This professor was merely a *kooky*, or slave, but by skill and industry he raised himself to an equality with the greatest men of his country; and as every chief who employed him always made him some handsome present, he soon became a man of wealth. My friend Shulitee (King George) sent him every day the choicest things from his own table. Though thus basking in the full sunshine of Court favour, Aranghie, like a true genius, was not puffed up with pride by his success, for he condescended to come and take tea with me almost every evening. He was delighted with my drawings, especially with a portrait I made of him. He copied so well, and seemed to enter with so much interest into the few lessons of painting I gave him, that if I were returning from here direct to England, I would certainly bring him with me, as I look upon him as a great natural genius."—P. 187.

The residence at Tristan d'Acunha, although it comes last in the book, in the order of time preceded that at New Zealaand. Mr. Earle was left behind there on his voyage from Rio to the Cape of Good Hope, by the sudden sailing of the vessel in which he was passenger. He found on the island a little colony, whose chief members he thus describes:—

"The chief person of our little community (commonly called the *Governor*) is Mr. Glass, a Scotchman, a *ci-devant* corporal of the Artillery Drivers; three other companions have all been private seamen, *who have remained* here at different times in order to procure sea-elephant and other oils, to barter with vessels touching here; and they all partake greatly of the honest roughness of British tars.

"Accustomed to be either in their whale-boat, pulling through the most dreadful surf that can be conceived, or covered with blood and grease, killing and preparing for use the marine animals who assemble round this island, it cannot be expected their manners or appearance should partake much of elegance or refinement, or their conversation be such as would be tolerated in polished society; but it is altogether a new scene to me, and I take infinite delight in hearing them relate their different adventures in their own peculiar seaman's phraseology.

"Of the fair ladies of our colony, Mrs. Glass is a Cape creole, and Mrs. White a half-cast Portuguese from Bombay; their time is so fully occupied, that I seldom see either of them, being constantly in the cook-house, which is separated from our dwelling. Children there are in abundance, all healthy and robust, and just one year older than another.

"Glass is one of the garrison the British Government sent here some years since, and which was soon after given up; but he and his wife requested that they might be permitted to remain."—P. 295.

Here, however, we again seek in vain for information of the kind most wanted: we find no description of the natural products of the island; no sketch of the early progress of the isolated settlers, and their methods of overcoming the difficulties incidental to their situation—a sketch which would have been, doubtless, highly interesting. The narrative, which is not a little amusing, as it stands, consists principally of sketches of the lives of the rough and hardy settlers—an account of an excursion or two to various parts of the island—and, to make the matter thick and slab, the endless lamentations of the author at the passing of every fresh sail. His omissions are, perhaps, less to be regretted that they can pretty well be filled up from the very curious papers of Jonathan Lambert, (Lambat, as he is erroneously styled by Mr. E.), an enterprising American, who, some years ago, took possession of Tristan d'Acunha, and, by right of priority, proclaimed himself its sovereign, concocted a "national flag," and declared the little rock of the ocean an independent state! His documents, which included, besides the "state papers," a very minute de-

scription of the island, its natural productions, and commercial capabilities, were published, several years ago, in Blackwood's Magazine, although Mr. Earle appears to be totally unacquainted with them. As to King Jonathan, he had disappeared before the garrison to which Glass belonged arrived, and there is but too much reason to suppose he was murdered by one of his subjects, an old Italian, who, except a boy, was the sole inhabitant of the kingdom when the English soldiers were placed there.

It might have been expected, from the nature of Mr. Earle's profession, that his volume would have been profusely illustrated with engravings; there are, however, not above half-a-dozen in the whole, of which that representing "Governor" Glass and his hut possesses the most interest.

Expression of Oils.—Sir, I have just received some seeds from the West Indies which seem to me to contain a great deal of oil. Is there any practical process, either mechanical or chemical, by which I can ascertain the absolute quantity of oil in them, or the relative (in the same way) as compared with the produce of a certain weight—say ¼ of an ounce of bitter almonds, treated in the same manner? Pressure seems inapplicable to such small quantities; and I have no apparatus at hand. Will any treatment with water, or any other fluid, give the results? or with Alkalis? or with any powdered substance which easily absorbs oil? or could any use be made of isinglass or white of egg, to carry down the insoluble parts of an emulsion, and so allow the oil to float on the top? These questions are partly to be solved on chemical principles; but I hope they are not so entirely chemical as to be inadmissible into your pages.—Yours, &c., PHILO-OLEI.—Is the oil of the cashew-nut used for any, and what, purpose? It is extremely acrid, and may have some very powerful qualities.

On Sleeping at Lectures.—Sir, speaking from experience, I think I can recommend to your correspondent, S. P., a very simple remedy for the drowsiness of which he complains. The fault, as one might be led to infer from your remarks, Mr. Editor, is not always the lecturer's, but generally arises from the state of the physical energies of the hearer; and as I think it is a very generally acknowledged principle that change of occupation is most frequently sufficient to refresh the wearied mind, I would suggest one, that to myself produces a most advantageous result. I am engaged all day in a laborious profession, and am ever anxious to attend lectures connected with subjects that relate to my professional pursuits. I used to find myself often oppressed as your correspondent describes himself to be, and I adopted forthwith the habit of taking notes in the following manner:—I procured a neat book, which did not quite fill my coat-pocket, and with a pencil made short notes on pages 2, 4, 6, 8, 10, and so on, of the Lecturer's observations. On my return home I re-wrote the whole more at length in ink, and beginning on page 1, and filling both 1 and 2 with the pencil-notes of page 2 enlarged, found that I lost no space, and filled up my book *without having to write on* the pencilled page, until *that part being copied*, allowed of its being rubbed out. Thus I have several note-books, full of useful and interesting matter, to refer to; my attention is fully awake to the whole subject during the lecture: and if, upon going through the revision and re-writing of my notes, I find some obscurity which I cannot explain, it is easily cleared up by reference to the Professor, either before or after the next lecture.—I am, Sir, your subscriber and occasional correspondent, J. L. D.

Mr. Busby's Heating Apparatus.—In noticing last week the experiment made with this apparatus at Mr. Eckstein's manufactory, we stated that "the heated particles of water circulated to a distance of 21 feet from the fire." We perceive, from some inquiries which have been addressed to us on the subject, that we should have mentioned more decidedly that the circulation was carried 21 FEET BELOW THE FURNACE; the distance from the furnace by the course of the eduction-pipe being 45 *feet*, and the total length of that and the return-pipe 90 *feet*.

INTERIM NOTICES.

To our American Readers.—As our arrangements in regard to the American edition of the Mechanics' Magazine will expire with the completion of the present volume, Booksellers and others in the United States, who wish to have the work continued, will please to make application without delay to Mr. Rich, 12, Red Lion-square, London, who will continue to furnish the American edition on the same terms as heretofore. A large allowance made to those who take considerable quantities.

We regret that we have not room this week for "An Unprofessional Reader's" corrections of the "Retired Reader's" corrections of Childe Harold.

Mr. Shaw.—The paper offered will be very acceptable.

We have objected repeatedly to the principles on which the Useful Knowledge Society is established; but our objections apply equally to all corporation efforts for the dissemination of particular views and opinions. Our "Orthodox" correspondent must, therefore, excuse us for declining to insert the paper he has sent us, recommendatory of a certain rival Association.

We dislike the false colours under which the P. C. appears in the advertising columns of the newspapers; and for the present, at least, can give it no countenance.

Will P. Q. N. favour us with a specimen?

J. E. says, in a postscript to a letter in reply to Mr. Baddeley and others on drawing-papers, which we shall insert next week, "May I ask of 'One who Lives to Learn,' where his paper may be procured?"

T. H. S.—No reward has been offered by Government, nor, we believe, by any other public body.

Communications received from Mr. Maddock—M. M. Z.—Mr. Baddeley—R. J. E.—Q.—Mr. Reed—G. J.—Hezron—Mr. Deakin.

Erratum.—In the description of Hunter's Screw-Press Improved, No. 466, p. 212, col. 1, for "*c* 201 and *d* 200," read "*c* 200 and *d* 200."

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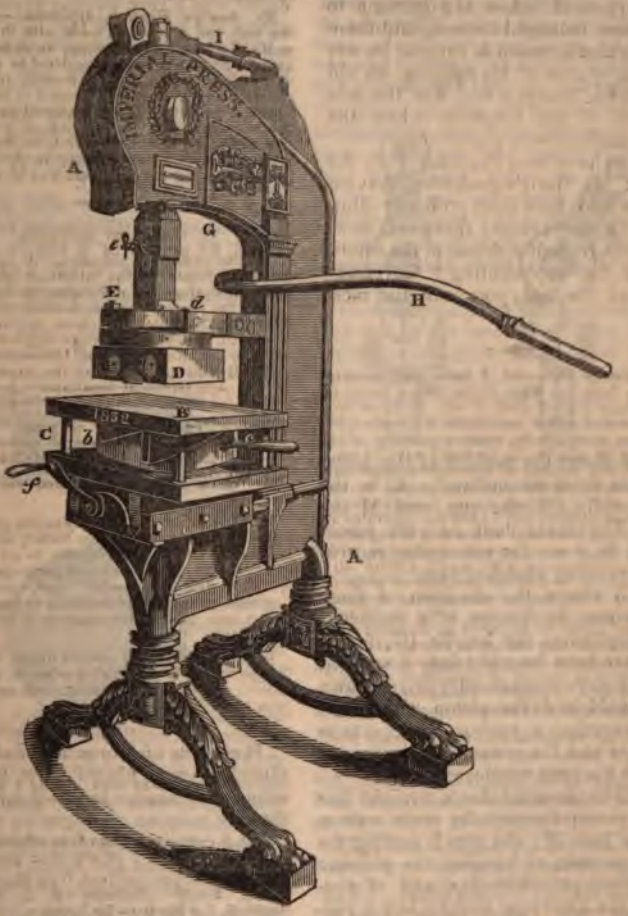
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 472.] SATURDAY, AUGUST 25, 1832. [Price 3*d*.

IMPERIAL ARMING PRESS.

Fig. 1.



Sir, — The above engraving represents a simple and powerful arming press for the use of bookbinders, embossers, and others, lately invented and manufactured by Messrs. Cope and Sherwin, of Cumberland-street, Curtain road, Shoreditch; and is upon the same principle, as their much-approved imperial printing-press, briefly described at p. 70 of your 12th volume.

In the *engraving, fig. 1*, *AA* is the staple or standard of the press. B is the bed-plate, with a contrivance for raising and falling it (*b*), which will be hereafter noticed. C is the carriage, which traverses ba kward and forward, by means of a screw, put in motion by the handle *f*. D is the heater-box, with holes for two heating-irons, and to which the die or tool is attached. *d* is one of two guides, the other being on the opposite side. E is the piston, with the ad-

justing screw, *e*. G is a strong spring, to raise and support the piston with its attachments. H is the handle. I are connecting rods.

Figs. 2 and 3 exhibit the construction or the principal working parts of this press, and they will also serve to explain those parts of the imperial printing press which were omitted in the description of that machine in vol. 12.

Fig. 2.

Fig. 3.

Fig. 2 shows the position of the internal parts in a state of rest. K is the chill or chile. L the cup, and M the bolt. The main bolt or axis passes through K at *n*; the connecting rods of the levers being attached at *o*.

Fig. 3 shows the situation of these parts, when, by means of a sufficient power applied to the handle (H, fig. 1) they have been brought into a straight line, and have consequently driven down the bolt M and the piston with great force; exerting a pressure, adequate to the power and the system of levers upon which it has been employed.

It will be observed that a straight line always passes through the main axis *n* and the bolt M; the cup L serving the double purpose, of keeping the pressure at all times perpendicular, and of converting the otherwise *sliding* into a rolling motion, thereby reducing the friction to the least possible.

Besides which, the surfaces are all carefully hardened, and are made so true in the first instance, that the friction is, for so powerful a machine, inconceivably small. The form of the parts is peculiarly adapted to retain oil for the lubrication of their surfaces, and any of *the imperial presses* may be taken asunder, cleaned, oiled, and refitted, in the space of a few minutes, which is an advantage of considerable importance to printers and others who use them.

I have seen the cup and bolt of a large imperial press, which had been in constant use for about four years, and the only visible effect that had been produced was a very *narrow burnished line* across the centre of the face of each nothing like *wear* being perceptible, although great pressure had been employed.

The bolt M rests upon one or more wedges in the piston, which admit of great accuracy of adjustment, by means of the screw *e* (Fig. 1).

In addition to the nice adjustment thus afforded, a still greater range is obtained, by means of a simple and ingenious contrivance, which will, I hope, be understood on reference to Figs. 4 and 5.

Fig. 4.

Fig. 5.

It consists of two series of circular inclined planes, placed one above the other, very similar to the *clutch-box* used for the purpose of engaging and disengaging certain parts of machinery.

Fig. 4 shows the lower series of inclined planes detached, and viewed vertically. Fig. 5 shows the two in combination, situated as in fig. 1. The upper series *r r* is fixed to the bedplate which rests upon it, while the lower series *s s* has a horizontal rotary motion, being held in any required position by a pall, which takes into a ratchet on its lower edge.

The dotted lines represent the lower series of inclined planes turned about a quarter round, from right to left (which is the extent of their motion), by means

of the handle C: the consequence of which is, that the upper series with the bed-plate, will have been raised from *v* to *x*; the plate being guided in its motion by four pillars, three of which are shown in fig. 1. Of course the bed-plate can be set at any intermediate distance.

Upon the bed-plate are fixed two parallel rulers at right angles to each other, to enable the work to be accurately squared, centred, &c.

To the bookbinder—for working off extensive letterings, large toolings, or embossments, this press is invaluable, and there are many other purposes to which they may also be applied with equal advantage and success.

Having inspected several of these presses, and having witnessed the performance of one in full work, I have no hesitation in pronouncing them very far superior to every machine hitherto applied to similar purposes. Simple in principle, elegant in appearance, powerful and efficient in operation; these presses cannot fail amply to repay their talented and deserving inventors.

I am, Sir,
Yours, respectfully,
W. BADDELEY.

London, Aug. 14, 1832.

THE MAGNETIC-NEEDLE.

Besides those two well-known deviations of the magnetic needle, the dip and variation, it has been found that there are two other inaccuracies to which this essential instrument is liable.

In the first place, it is subject, like the barometer, to a small diurnal variation, which, in most parts of the world, is regular in its extent, and periodical in its changes. This minute motion can only be detected by the most delicate observations; and the smallness of its amount will always render it an object of insignificance with the practical sailor. Although it thus appears now as almost an evanescent link in the great chain of effects, yet perhaps, at some future period, it may in the hands of some fortunate observer, become a means of developing combinations and causes of the highest order. The five great agencies of heat, light, magnetism, galvanism, and electricity, sensibly appear to radiate from some grand centre; and it wants but one flash of an all-powerful mind, like Newton's, *to draw order out of chaos.*

The remaining error to which the compass is subject is that which is denominated local attraction. This is a subject of paramount importance to the shipping interest in all its branches; and we are sorry to say it is little understood, and less attended to. Who would think that far advanced in the 19th century, England, pre-eminent as she is in all the arts and sciences, sends forth her military and commercial ships to every corner of the earth, bearing within themselves the elements of their own destruction; that each vessel has her course, night and day, depending upon an instrument which has not only been shown to be notoriously false, and to have caused the wrecks both of men of war and merchantmen, but which can with ease be rendered true?

To this undeniable fact may be added, that up to the present day no ship in our national marine is furnished with an azimuth-compass fit to be used by a ditch-maker—not even our first-rate men-of-war, each costing the nation £100,000, and containing 900 of those men, who, although they have fought themselves out of bread, and are no longer wanted, need not be drowned, like superfluous kittens, for the mere fun of the thing.

The first notice which we have of local attraction is in Dampier's Voyages. Subsequent navigators reported that their compasses were also grievously subject to anomalies. Wales, the astronomer, who sailed with the immortal Cook, first gave them a tangible shape, by remarking that variations observed with the ship's head in different positions, and even with her head continued the same, but with the compass placed in different parts of her, would differ considerably from one another, up to as much as 10°.

The best navigators, English and foreign, were alike perplexed with these eternal discrepancies. Flinders first assigned as a cause, that the iron in the ship acted on the compass, and produced all these anomalies; and, by a long and patient series of observations, he framed a set of (mathematically speaking) empirical tables for their correction. These, however, Mr. Bain, Captain Sabine, and others, proved to be insufficient. In fact, the law which governed this variable magnetic action of the iron not being known, all were groping in the dark; and even the powerful

mind of Dr. Young failed in endeavouring to grapple with this intractable source of danger.

In 1820, Mr. Barlow, of the Royal Military Academy at Woolwich, succeeded in developing this law. He proved that in every unmagnetized iron body there is a plane which may be considered its equator; that when the centre of a magnetic-needle is placed in this plane, the iron does not attract it; when it is above it, it suffers a directly contrary attraction to that which it does when it is below it; and that this plane being at right angles to the dipping-needle at Woolwich, it may be inferred that it is so in all parts of the world. This has since been completely proved in almost every navigable part of both hemispheres.

Here, then, was a clue to a complete elucidation of all the intricacies of the subject; this plane of neutrality being constant, while the ship herself varies her position, she will necessarily present at one time north poles towards the compass, and at other times south poles, from the same piece of iron; in fact, while every piece of iron in her is found to vary in its effects on the compass according to the position in which it lays, all these effects are referable to this one law, that a plane passing through their centres of attraction, in a direction at right angles to the dipping-needle, will divide them into north and south polarity, and that this polarity will instantaneously be reversed by reversing the ends of the iron body.

In his able work on this subject,* Mr. Barlow, making use of an iron ball or shell, imagines circles of latitude and longitude to be drawn on an ideal sphere, this ball being supposed to hang in its centre, and the intersection of its neutral plane (when extended to the sphere) tracing out the equator, the first meridian passing through the east and west points. He then finds that the tangent of the angle of deviation which this ball would produce on a compass placed any where on this imaginary sphere, is proportional to the rectangle of the sine of the double latitude and the cosine of the longitude.

When the distance only is variable the tangent of deviation is reciprocally proportional to the cube of the distance.

All other things being the same, the tangents of deviation are proportional to the cubes of the diameters of the balls or shells, whatever may be their masses, provided their thickness exceeds about $\frac{1}{10}$ of an inch.

These laws Mr. Barlow thus expresses,

$$\tan.\ \Delta = \frac{D^3}{A d^3}.\ (\sin.\ 2\lambda \cos.\ l.)$$

Where Δ is the angle of deviation, λ the latitude, and l the longitude on the ideal sphere, d the distance of the ball from the pivot of the needle, and A a constant coefficient to be determined by experiment; and these laws hold equally true with the most irregular bodies as with the balls or shells used in the first instance. For the other able and scientific deductions of Mr. Barlow we must refer to the work itself, and come at once to that which is essential to the practical man.

It is well known that where there are a great number of disturbing forces all differently posited, yet all acting on one point, they may be reduced to a single resultant; and in the case of a number of iron bodies acting on a magnetic-needle, Mr. Barlow finds that it is easy to place a plate of iron in the line which joins this single resultant with the pivot of the needle, so that it shall just double the effect of these variously-distributed bodies.

In a ship we have guns, bolts, bars, staunchions, tanks, ballast, cargo, &c., all forming a mass of attraction on the compass, which varies its nature as the vessel varies the position of her head, thus insidiously leading the mariner to destruction through the very instrument to which he looks for safety. Mr. Barlow conceives the centre of this mass of attraction generally to be situated before and below the binnacle in which the compass is placed; if, then, in a line joining this centre of attraction and the needle-pivot, there is placed a plate of iron, removeable at pleasure, and the distance of it from the compass is so determined by experiment that it just doubles the effect of the before-mentioned iron bodies, it is plain that the alteration which the application of this plate is found to make on the compass, whenever it is applied, is just that quantity which the iron in the ship had on it before, and that the course is to be corrected by the quantity which the plate thus causes the compass to deviate.

* *Essay on Magnetic Attractions*, &c., 2d edit. *Taylor, Holborn.*

It is a singular fact, that at the very time that Mr. Barlow was occupied with this subject, it had also particularly engaged the attention of Mr. Lecount, (the author of the paper, inserted in our last Number, on rectifying pivots), who was then an officer on board H. M. S. *Conqueror*, stationed at St. Helena; and that both gentlemen, unknown to each other, arrived at nearly similar results. Mr. Barlow, as we have mentioned, announced his discovery in 1820. In Dec. 1820, Mr. Lecount, who had then just returned to England, published a pamphlet, entitled, "A Description of the Changeable Magnetic Properties possessed by all Iron Bodies, and the different Effects produced by the same on Ships' Compasses, from the Position of the Ship's Head being altered;" and in an "Advertisement" which precedes it, he states that he had "discovered that a work of a similar nature had been published by Mr. P. Barlow," but that he "never saw or heard of that gentleman's essay until after his own work went to the press." In this pamphlet Mr. Lecount lays down the law which governs the changes caused by local attraction in much the same way as Mr. B. "A plane or circle," he says, "held east or west (magnetic) and *at right angles with the direction of the dipping-needle*, will in any part of the world divide the north from the south magnetic effluvia, each lying on that side to which the dipping-needle points; and by referring the position of all iron bodies to this plane, the line of intersection shall divide the iron into north and south polarity, *provided it is of uniform thickness.* If it is not of uniform thickness, the intersection must be drawn not through the centre of its length, but through its centre of gravity." He then relates a number of experiments which he made at sea in verification of this law, and thus sums up the result:—"These experiments, when carefully made, all tended to one universal result, and showed that the magnetic effluvia moved in lines perpendicular to the plane or circle held or placed as before directed; and the dip may always be found sufficiently correct to rectify this circle by a bar of iron to be held due north and south (magnetic), and inclined till its end becomes neutral." Mr. Lecount proposed to ascertain the quantity of *error arising in each case from* these local *auses by calculation* (differing in this chiefly from Mr. Barlow), and showed very satisfactorily how this might be done with sufficient accuracy for all practical purposes. His pamphlet is, altogether, a very shrewd and ingenious production; and may be still read with profit by seafaring persons—the more especially, seeing that Mr. Barlow's invention, notwithstanding its simplicity, cheapness, and perfect efficiency, and the great noise which was at one time made about it, has never yet come into more than very partial use. We believe that not more than half-a-dozen ships of the Royal Navy have, in the course of a dozen years, been fitted with Mr. Barlow's plate; and are not aware of its having been ever adopted in the merchant service at all, except by way of temporary experiment.* Our Naval Administration seem, as usual, determined to wait till every other country has benefitted by the invention except our own—adhering religiously to their golden rule of never adopting any improvement unless it either leads to a job, or is forced upon them; and in the latter case, never to reward the inventor unless they are compelled to do that also.

SELF-SUPPORTING HEALTH SOCIETIES.

We took occasion in our 13th vol., page 62, most earnestly to recommend to the attention of our readers the benevolent and judicious plan of Mr. Smith, of Southam, for the establishment of *Self-Supporting* Charitable and Parochial Dispensaries throughout the Kingdom. Our attention is now drawn again to the subject by a short "Address" which this active philanthropist has published to the Members of the Self-Supporting Dispensary under his own immediate charge, "as well as other labourers and mechanics," on the precautions which are proper to be taken against the

* The non-adoption of Mr. Barlow's plate in the merchant service may be possibly accounted for by a remark made in Mr. L.'s pamphlet. He observes, "the nearest (iron) bodies of any magnitude to compasses are the guns; and they therefore require the most attention; and as their effect must be greater in proportion to their proximity to the compass, I have found, and I think it appears reasonable, that the smaller the ship the more the compasses will be affected, for as her breadth decreases, the guns are brought so much nearer to the compasses. And from this I conceive that *in a merchant-vessel*, without guns, iron cargo, or iron staunchions, hoops, &c., near the compasses, and those compasses placed ten feet from each other, *that no variation would be perceived in any position of the ship's head.*"—P. 22.

prevailing epidemic. Since the appearance of the Useful Knowledge Society's excellent Treatise on Cholera (written, we have heard, by Dr. Conolly) we have met with nothing more shrewd and sensible on the subject than this letter of Mr. Smith's. He gives all due praise to government for the sanatory measures it has adopted on the occasion; but insists that in this as in all cases, the people's best dependance is on themselves. He is of that sound class of social reformers, who think that if "you help yourself, heaven will help you," and that the worst enemies of the poor are those who, by accustoming them to look for assistance, on every emergency, to the pockets of the affluent, make "beggary a better trade than the spade and the workshop." He recommends the working classes to provide, by some such system of mutual assurance, as that which is embodied in the plan of the Self-Supporting Dispensaries, against the dangers with which they are threatened by the introduction of this new scourge into the country. It appears from some documents which have been sent to us along with the "Address," that there are now sixteen of these Self-Supporting Dispensaries in successful operation; and that a very small contribution weekly (in most cases not more than a penny) is generally sufficient to obtain for the sick members, a greater choice of advice and a better supply of medicines, than they could procure in any other way, whilst by this means they are kept off the parish, and preserved in a state of honest, however humble independence. Mr. Smith further exhorts the working classes, and with much affectionate earnestness, to stand by and assist each other when attacked—to "bear each other's burdens, and so fulfil the law of Christ." How much the "consciousness of doing a good work" may fortify, sustain, and protect persons from infection, has been made abundantly manifest, by the small number of persons engaged in active attendance on cholera patients, who have caught the disease; and is beautifully exemplified by the following anecdote related by Mr. Smith:—

"I lately witnessed at Newbold four fine young men rubbing the limbs and body of an aged woman, one of whom, *with tears in his eyes*, told me she had *been as good as* a real mother to all the *poor in the parish*; he said she had helped *to nurse them all*, and that she had laid out seven of his companions in as many days. It was indeed a noble sight, to see how earnestly, generously, and freely, these hard working men, lions as they had been, tamed and dismayed by the havoc death had made amongst them—how affectionately they waited on their old afflicted friend—and when, with returning warmth, the aged dame desired one of them to go and communicate to her friends outside the door, that she was better, that she believed her life was safe, for past experience made her quick in detecting symptoms, I saw the tears trickle down many cheeks that appeared unused to weep. I rejoiced to hear she quite recovered, and that none of her kind friends suffered."

We are glad to learn that Mr. Smith's "Address" has had so good an effect on the inhabitants of his immediate neighbourhood, that measures are now in progress for the formation of a Southam Anti-Cholera Association on the co-operative plan which he recommends, in aid of, and supplementary to, the Self-Supporting Dispensary. We subjoin the leading provisions of this projected Association, for the benefit of persons in other parts of the country, who may be disposed to follow the example of our Warwickshire friends:—

"1. Each head of a family is to subscribe any sum weekly that may be convenient from 3*d.* to 5*s.*; and to have returned to them twelve times its amount daily, from the time any of his or her family is confined to bed with spasmodic cholera until convalescence or death.

"2. Persons subscribing less than one shilling per week to be allowed 2*l.* for funeral expences, on the death from cholera of any member of his or her family; and subscribing more than one shilling, a sum proportioned to the amount of the subscription.

"3. All subscribers to continue their subscriptions till the treasurer has been repaid all payments which he may be called upon to make in addition to the sum he has in hand, and until such time as the Board of Health shall declare that they have no reports of the disease existing in either of the counties of Warwick or Northampton.

"4. Should there be any surplus of funds on the happy event last mentioned, it is within two months after to be disposed of as follows: four-eighths to be laid out in defraying the expences of a day of thanksgiving and rejoicing; two eighths to be paid over to the widows of such persons as have died of the cholera; and two eighths to be placed in the Savings'

Bank, in the name of such children as have been made orphans by the cholera, there to remain and accumulate till they attain sixteen years of age."

We approve of all these regulations save the last. We think the survivors may be very well content to be at the expense of their own thanksgiving and rejoicing, and would divide the entire surplus among the widows and orphans.

NEW PROJECT FOR MULTIPLYING FOOD.

It was the Scottish patriot Fletcher, of Saltoun, we believe, who first said that the greatest benefactor of humanity was the man who could make two ears of corn grow, where there was only one before. A much greater benefactor of humanity than ever Fletcher dreamt of, has just arisen on the horizon in the person of a certain "Henry Hiort," who announces, in a pamphlet now before us,* that if the farmers of England will only listen to such advice as he has it in his power to give them, two years shall not elapse before "the wheat ear shall be *twenty per cent. heavier* than the largest that can be found at this day!!!" Twenty for one, instead of two for one! Talk of the march of intellect! Give us the march of corn (all corn laws notwithstanding) before all other marches in the world! The author, or *composer* rather, of this prodigious *march* is apprehensive that the British farmer may "muse with astonishment, and say, is it possible? is it practicable?" But to this he has a most sufficient answer at hand:—"Use but industry and judgment." We find, to be sure, on reading a little farther, that the farmer must use his "industry and judgment," only as the said "Henry Hiort" has it in his power to direct; and that this twenty-plus improver and benefactor cannot, "*in justice to himself*"—considering what labour and what expense the discovery has cost him, and what a thankless world it is which he lives in—give the necessary directions to the British farmer until he "has obtained a sufficient number of subscribers (size of the work and price not stated) as may "enable him to go to press *with safety to himself*." Admirable philanthropy! Still more admirable self-regard! Mr. Hiort mentions the case of a person, who, about twenty years ago, "boldly stood forward, and broached a plan that was to make every man's fortune who possessed a farm—to make his land increase immediately 10 per cent. in value, and to protect the crop against all disease." It seems that this 10 per cent. improver required each person to pay five pounds for his secret, and that "he received many a five pounds for the same;" but that "no sooner was his secret pretty well circulated," than it was "discovered that it was nothing more than a particular routine of crops with which every farmer had been conversant for years;" and *then* "the premium for the secret fell 100 per cent." Now, although Mr. Hiort adverts to this case with all the disdain of a man who would be above such tricks, we are afraid that the mention of it will not much lessen the natural inclination of persons who have been once so hoaxed, to ask, "What security have we, that this 20 per cent. schemer may not prove as great a deluder as our old five-pound friend?" We do not observe that Mr. Hiort offers any such security, and cannot imagine any that would be accepted as altogether satisfactory. The object of his present "Apology" is to produce the necessary degree of "lively faith" in his assurances; but though it contains some ingenious and amusing speculations on the possibility of such an increase in farinaceous produce as he promises, we see nothing in it, that would induce us to pin *our* faith to his coat-sleeve. Mr. Hiort reasons in this way. The common sweet briar has been converted by cultivation into the double rose; wild asparagus, not thicker than a lady's little finger, into garden asparagus as thick as an alderman's thumb; and the wood strawberry into a fruit, vieing in size and flavour with the finest hautboys. Now, if productions which are mere "luxuries of life" can be so improved, why should not productions that are essential to life be equally so? Besides, there seems reason to believe that the farinaceous grains have "greatly degenerated from their pristine state;" because we know

* "An Apology for Inviting Public Attention to a Method of so Managing the Farinaceous Seeds and pulse as will induce a rapid improvement in Agriculture, and advance the Prosperity and Happiness of the Nation; with an Appendix, containing outlines of a plan to establish an Agricultural School of Industry in each County of the United Kingdom. By Henry Hiort." 8vo. pp. 34. Westley, 1833.

the children of Israel were accustomed to eat wheat in three different ways, "as bread, as parched corn, and as green ears;" whereas our corn is and can only be used in the first of these forms; whence "the conclusion may be fairly entertained," that in Egypt "the ear of wheat was of greater bulk than any England can boast of at present." "Why not then endeavour to restore it to its original stamina?" A question, which, translated into plainer English, means, we presume,—why not subscribe for Mr. Hiort's secret? Now, though all this may be very plausible reasoning, we cannot help thinking that the sight of an actual ear of wheat "20 per cent larger than the largest" heretofore known would be worth such reasoning ten times over. If Mr. Hiort is in possession, as he says he is, of the means of producing such ears of wheat, let him stick up one as a sample in Mark-lane or at the Corn Exchange, and we will answer for it, he will have subscribers and patrons in abundance. A claimant is always bound to produce the best evidence he can; and Mr. H. should not be angry if people refuse to be put off with chaff, when he tells them he has grain in his pocket.

THE BRICK TAX.

(From Part III. of the Encyclopædia of Cottage Farm, and Villa Architecture.*)

The terro-metallic earth of Staffordshire would form admirable columns, lintels, summer-stones, copings, ornamental chimney-tops, and other component parts of buildings. Indeed, much might be done with common brick-earth; but, unfortunately for Britain, all articles formed of this material are heavily taxed, and, to save trouble to the exciseman, the brick-maker is only allowed to make his bricks of certain forms and dimensions, viz. for building-bricks, 9 inches by 4½ inches and 2½ inches. If he deviates from these, and makes a brick either longer or broader than usual, or impresses a moulding on one end, or on one side, he renders himself liable to such an increase of duty as amounts to a prohibition of the article. Two or three centuries ago, bricks were made in every form, ornamental and useful, which the architect could desire; for a proof of which we have only to look to the Elizabethan mansions which still exist in different parts of the country. Even so early as the time of Henry VIII. the art of making bricks to serve all the purposes of stone in the jambs and lintels of doors and windows, appears to have been carried to a great degree of perfection. At Sutton Place, near Ripley, in Surrey, built by this monarch's brewer, the piers, lintels, mullions, chimney-tops, tracery in the windows of the chapel, and other parts, some highly ornamented, are formed of artificial stone, or brick, and are still in excellent repair.

* A Warwickshire correspondent observes, in a recent communication to us:—"I was led by what you said of Mr. Loudon's Architectural Encyclopædia, to become a subscriber to it, having much to do in the building way on some estates of which I have the management. The work is certainly a very useful one, and I make no doubt will be henceforth considered an indispensable *vade mecum* for all land improvers. However—for even the sun has its specks—you must permit me to say (and that, with your leave, *publicly*), that Mr. Loudon seems too fond of setting up castles (like cards) merely to knock them down again. A good many of his designs—that is, of the designs furnished to him in pursuance of his general invitation to all the brick-and-mortar public—are, according to his own "Remarks," as bad as it is possible to conceive. What improvers like myself want to know is, not what Mr. Anybody may think a good plan for a cottage, farm-house, or villa; but what Mr. Loudon, a gentleman of much travel, great experience, keen observation, sound taste, and high authority, would recommend as, on the whole, the *best plan for the purpose*. In short, we want *master models, not apprentice essays*."

SOCIETY FOR THE ADVANCEMENT OF ARCHITECTURAL KNOWLEDGE.

Sir,—I beg to acquaint you, for the information of your correspondent who so ably advocates, and, by the bye, very properly, the abolition of the present chimney-pots—that an Architectural Society was established last October, for "The Advancement of Architectural Knowledge." The meetings are held every alternate Tuesday during the season, which commences in November and ends in June, at the Quadrant Hotel, Regent-street. To forward the object of the Society, papers on architectural subjects are read at the meetings; and new publications relating to the arts are laid on the table for the perusal of the members. William Barnard Clarke, Esq., the author of several works on ancient architecture published by the Society for the Diffusion of Useful Knowledge, has been re-elected to fill the chair for the ensuing session.

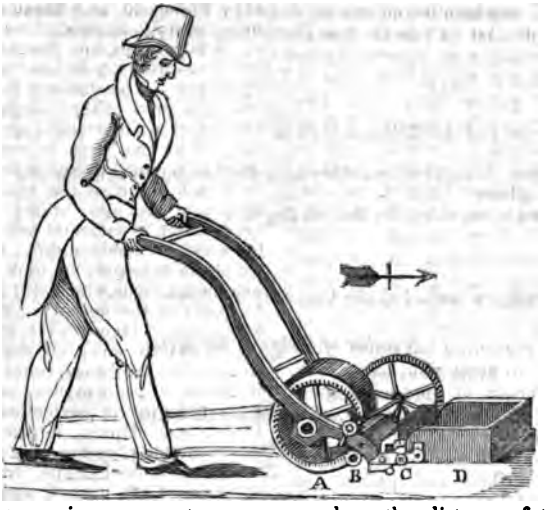
I am, Sir,

Yours obediently,

A Member of the Committee.

THE GRASS-SHEARING MACHINE,

Employed at the Zoological Gardens.



The above engraving represents a new machine for shearing lawns, grass-plots, &c., which has been recently introduced into the Zoological Gardens, and where it may be frequently seen in operation. It is the invention of a Mr. Budding, and manufactured by Messrs. Ransome of Ipswich. The person using it places it so as to bear his whole weight on the cast-iron drum A and the wood roller B; he then takes hold of the handles, as represented in the figure, and with the right thumb pressing the end of the bent lever towards the right side of the frame, pushes the machine steadily forward along the greensward, in the direction of the arrow, without lifting the handles, but rather exerting a moderate pressure downwards, not so much however as to lift the wood roller B off the ground, which would raise the cutters above the grass. As the machine advances, the wheels turn and drive round the spiral blades, fixed on the axis at C, with proper velocity, so as to cut off the grass and throw it forward into the box D. The closeness of the cutting, or the length of the grass left on the turf, depends on the distance of the gage-roller B below the frame; and this can be varied, by raising or lowering the two slide-pieces by which the roller is attached to the frame and fixed by screws. The front edges of these slide-pieces have corresponding notches, serving as marks by which to set them both equally low. In drawing the machine backward, the wheels do not turn; and the noise of the ratchet may be prevented by the right thumbs pushing the lever towards the left side. The grass is cut best when dry and not too long. The revolving blades should just touch the straight edge of the lowest blade lightly. When worn by long use, they may be lowered to it by two vertical adjusting screws situated at each side between B and C. When the revolving cutters require sharpening, the edges are oiled, and a little flower of emery shaked on them; the iron handle is then screwed into the rim of the toothed wheel, which is outside of the frame, and turned backwards for some time; and lastly, the blades are wiped quite clean from the emery, and the adjusting screw set.

LIVERPOOL AND MANCHESTER RAILWAY.

We extract the following gratifying statement of the results of this great undertaking from *the last Annual Report* of the Directors to the Company of Proprietors:

The data which it supplies, for estimating the probabilities of success offered by similar undertakings are of the greatest importance.

The tonnage of merchandise conveyed between Liverpool and Manchester, from the 1st July to the 31st December, 1831, amounts to	52224	Tons.
Road Traffic - - - - - -	2347	
	54571	
Between Liverpool and the Bolton Junction - - -	10917	Tons.
Coal from Huyton, Eltonhead, and Haydock Collieries, brought by the Company's Engines - - - - -	7198	Tons.
Coal from Hulton brought by the Bolton Engines - - -	1198	
	8396	
Number of passengers booked at the Company's Offices - -	256321	

Number of Trips of 30 *Miles.*

With Passengers - -	2944
Merchandise - -	2298
Coal (300), or equalling 30 miles	150
Total	5392

Receipts.

Coach Department - -		£58348 10 0
General Merchandise	£30764 17 8	
Coal Department -	695 14 4	
		31460 12 0
		£89809 2 0

Expenses.

Office Establishment -	£ 902 3 10	
Coal Disbursements -	60 15 5	
Petty do. -	110 0 5	
Cart do. -	60 17 8	
Maintenance of Way -	6599 12 6	
Charge for Direction -	297 19 0	
Coach Office Establishment	589 5 9	
Locomotive Power -	12203 5 6	
Advertising - -	59 3 4	
Interest - -	2737 7 3	
Rent - - -	900 5 3	49025 18 5
Compensation (Coaching departmt.)	156 7 5	
Engineering Department -	625 0 0	
Carrying Disbursements -	10450 12 8	
Taxes and Rates -	2763 5 1	
Stationary Engine Disbursements	269 4 7	
Coach Disbursements -	6709 7 11	
Waggon do. -	979 19 8	
Compensation (Carrying Departmt.)	786 8 2	
Police Establishment -	1490 14 1	
Law Disbursements -	98 9 10	
Bad Debts - -	175 13 6	
Nett Profit from 1st July to 31st December 1831		£40783 3 7

The foregoing particulars, when classed under the different heads of disbursement, will exhibit an expenditure per Ton and per Passenger, as shown in the following *Table.*

1st JULY to 31st DECEMBER, 1831.——*Disbursements apportioned under the different Heads of Expenditure.*

	Per Passenger Booked.	Per Ton of Merchandise Liverpool and Manchester.	Per Ton of Coal.	Per Ton on Bolton Tonnage.	Coaching Department.	Merchandise Department.	Coal Department.	Bolton Tonnage.	TOTAL.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*£. s. d.*	*£. s. d.*	*£. s. d.*	*£. s. d.*	*£. s. d.*
Disbursements in the MERCANTILE DEPARTMENT, consisting of Porterage, Salaries, Carting, Stationery, Engine Disbursements, &c. &c. . .	....	4 6¾	....	0 4	.....	12442 8 2	.....	183 4 0	12625 12 2
Disbursements in the COACHING DEPARTMENT, comprising Porterage, Salaries, Repairs, and including 3½d. per Passenger for Omnibusses . .	0 7	....	....	....	7455 1 1	.....	.....	.....	7455 1 8
Porterage, &c. in the COAL DEPARTMENT	....	....	0 2¼	....	.....	.....	97 1 5	.....	97 1 5
LOCOMOTIVE POWER ACCOUNT, proportioned according to the number of Trips of 30 miles, in each Department; comprising repairs of Engines, Wages, Coke, &c.	0 6¼	1 11	0 11¼	....	6664 13 6	5199 4 6	339 7 6	.....	12203 5 6
SUNDRY DISBURSEMENTS, proportioned according to the Receipts as between the Coaching and Merchandise Departments, and according to number of Tons and Miles conveyed, as between the Liverpool and Manchester, and Bolton Trade, comprising Maintenance of Way, Police Establishment, General Office Establishment, &c. &c.	0 6¼	1 1½	0 1	0 9	6722 5 0	3072 8 2	39 12 9	409 14 9	10244 0 8
RATES and TAXES, Interest on Loans and Chief Rents, proportioned according to the Amount of Profit in each Department, calculated *exclusively* of these items of Disbursement . .	0 4¾	0 4¾	0 0¼	0 3½	5088 1 6	1127 4 0	29 14 7	155 17 6	6400 17 7
Total Disbursements . . .	2 0¼	8 0	1 3¼	1 4½	25930 4 1	21841 4 10	505 16 3	748 16 3	49625 18 5
Nett Profit	2 6¼	2 7½	0 4¼	1 9¼	32418 8 11	7181 11 10	189 18 1	993 4 9	40783 3 7
Gross Receipts	4 6½	10 7½	1 8	3 2¼	58348 10 0	29022 16 8	695 14 4	1742 1 0	89809 2 0

From the returns of six fortnights, it appears the average number of men in the Company's employ receiving day's wages is 633; and of agents and clerks on salaries, 73.

The business of the Company is gradually increasing. In the half-year ending 31st December, 1831, the average quantity of merchandise conveyed per Railway, for a computed period of six weeks, was 15,112 tons. In the six weeks ending 23rd of March, the quantity conveyed was 16,000 tons.

The receipts in the coaching department in the twelve weeks ending on Friday, the 23d March, was £15,496. 11*s.* 6*d.* In the corresponding twelve weeks of the preceding year, £13,965. 6*s.* 11*d.*

A trade in coal by the Railway to Manchester has been commenced, which promises to become of considerable importance to the concern. Since the 23d January last, 3,615 tons of coal have been brought per Railway to Manchester, from the Haydock and Hulton Collieries."

The following is a summary view of the working of the concern, from the commencement to the 31st December last:—

"The Profits of the Company from the Opening of the Railway, on the 16th Sept. to the 31st Dec. 1830, were.....	£14,432	19	5
Ditto for the half-year ending 30th June, 1831	30,314	9	10
Ditto for the half-year ending 31st Dec. 1831.....;	40,783	3	7
	£85,530	12	10

The dividends have been as follows:—

	Shares of £100.			
In respect of Profits to 31st Dec. 1830, 6,375 *a* £..	£12,750	0	0	
Ditto ditto 30th June, 1831, 6,375 *a* £4 10				
Ditto ditto £25 shares. 6,375 *a* 9*s.* =1,593 *a* £1 16	31,556	5	0	
Ditto ditto 31st Dec. 1831, 7,968¾ *a* £4 10.....	35,859	7	6	
				£80,165 12 6
Leaving a balance in the hands of the Treasurer of....				£5,365 0 4

to meet those contingencies to which the working of every extensive and new undertaking may be considered more or less liable.

We embrace this opportunity of extracting from the evidence given on the Birmingham and London Railway Bill (so shamefully thrown out by the House of Lords), the following additional and very interesting particulars:

Before the establishment of the Liverpool and Manchester Railway there were 22 regular and about 7 occasional extra coaches between those places, which, if full, could only carry per day 688 persons.

The Railway from its commencement carried 700,000 persons in 18 months, being an average of 1070 per day.

It has not been stopped for a single day.

There has occurred but one fatal accident on it in 18 months.

The fare by coach was 10*s.* inside and 5*s.* outside.

By Railway it is 5*s.* inside and 3*s.* 6*d.* outside.

The time occupied in making the journey by coach was 4 hours.

By Railway it is 1¼ hours.

All the coaches but one have ceased running, and that chiefly for conveyance of parcels.

The mails all travel by the Railway, at a saving to Government of two-thirds of the expense.

The Railway coaches are more commodious than others.

The travelling is cheaper, safer, and easier.

A great deal of traffic which used to go by other roads comes now by Railway, both time and money are saved, though the length of the journey may be often increased.

The proportion of passengers carried by Railway over those carried by coach, has been as 22 to 10 in winter, and 17 or 18 to 10 in summer.

A regiment of soldiers has been carried by the Railway from Manchester to Liverpool *in two hours.*

Gentlemen's carriages are conveyed on trucks by the Railway.

The locomotives travel in safety after dark.

The rate of carriage of goods is 10*s.* per ton. By canal it used to be 15*s.* per ton.

The time occupied in the journey by Railway is 2 hours. By canal it is 20 hours.

The canals have reduced their rates 30 per cent.

Goods delivered in Manchester the same day they are received at Liverpool.

By canal they were never delivered before the third day.

By Railway, goods, such as wine and spirits, are not subject to the pilferage which existed on the canals.

The saving to manufacturers in the neighbourhood of Manchester, in the carriage of cotton alone, has been £20,000 per annum.

Some houses of business save £500 a year in carriage.

Persons now go from Manchester to Liverpool and back in the same day with great ease.

Formerly they were generally obliged to be absent the greater part of two days.

More persons now travel on their own business.

The Railway is assessed to the parochial rates in all the parishes through which it passes; though only 31 miles, it pays between £3000 and £4000 per annum in parochial rates.

Coal-pits have been sunk and manufactories established on the line, giving great employment to the poor. Manufactories also erected on the line, giving increased employment, and thus reducing the number of claimants for parochial relief.

The Railway pays one-fifth of the poor-rates in the parishes through which it passes. Fresh coal-mines sunk, owing to facilities of carriage and price reduced.

It is found advantageous for the carriage of milk and garden produce; arrangements about to be made for milk to be carried fifteen miles at 1*s.* for 10 gallons.

A great deal of land on the line has been let for garden ground, at increased rents.

Residents on the line find the Railway a great convenience, by enabling them to attend to their business in Manchester and Liverpool with ease at little expense.

No inconvenience is felt by residents from smoke or noise, and, on the contrary, great advantage is experienced by means of travelling, to and fro, distances of 10 miles in half an hour for 1*s.*, and without any fatigue.

The engines only burn coke.

The value of land on the line has been considerably enhanced by the operation of the Railway; land cannot be purchased but at a large increase in price.

It is much sought after for building, &c.

The Railway Company, in their late purchases, have been obliged to pay, frequently, double the price they originally paid for their land.

A great deal of land has been sold for building at three times its former value. Much waste land on the line has been taken into cultivation, and yields a good rent.

Landowners originally opposed to the Railway are now its warm advocates; having found their fears wholly groundless, they have been solicitous that the line should pass through their land.

THE TRANSLATORS OF CUVIER.

Two translations into English of Cuvier's *Regne Animal*, have been undertaken; one in England, by Mr. Griffith and coadjutors, the other in the United States, by Dr. M'Murtie; but we regret to perceive, from a very clever paper, which appears in a recent number of Mr. Featherstonehaugh's Monthly American Journal of Geology and Natural Science," that the one is as little likely to do credit to English, as the other to American literature. The writer characterises both as disfigured by the grossest blunders; and produces a number of striking proofs in support of his assertion. We shall select two or three of the more remarkable:—

M'Murtrie.—*At page* 12, line 18, we have, "Vegetables derive their nourishment from the *sun*, and from the circumfluent atmosphere in the form of water, &c." Cuvier says, "*Le sol* et l'atmosphére presentent aux vegetaux, pour leur nutrition, de l' eau, &c." It does not appear to have occurred to this *naturalist*, that the *soil*, which is the obvious meaning of the word *sol*, has any thing to do with the nourishment of plants. Griffith, in his translation of this passage, makes precisely the same mistake.

Griffith.—Cuvier, at page 15, of his introduction,* says, "Tous les êtres organisés produisent leur semblables; autrement la mort étant une suite necessaire de la vie, leurs especes ne pourroient subsister;"—which he has rendered, "All organized beings produce their

* Regne Animal, vol. 1, Paris 8vo. 1817, Londo...

like, otherwise death would be a necessary consequence of life, and the species must become extinct;" than which nothing can be more absurd. The true version is, "All organized beings produce their like; if it were not so, death, being a necessary consequence of life, their species would become extinct."

Dr. M'Murtrie.—"In the very next page to his blunder about the sun, the Dr. has the following passage:—The relations of vegetables and animals to the surrounding atmosphere, are therefore in an inverse ratio—the former reject water and carbonic acid, while the latter produce them." As there is not a tyro in the elementary lessons of chemistry, who will not be puzzled at this singular statement, which may reasonably discourage any one from looking any further into this translation, I feel called upon, by a sense of what is due to Cuvier, and to the reputation of this country for more correct knowledge, to expose what seems to have grown out of pure ignorance, both of the language and the subject. Cuvier, in a beautiful passage, is treating of the mutual action of the vegetable and animal systems, for the preservation of each. He states, that the soil and the atmosphere, present to plants for their nourishment water and air; that the first is composed of oxygen and hydrogen, the second of oxygen, azote, and carbonic acid, which itself is a combination of oxygen and carbon: that plants select from all these, hydrogen and carbon, for their own composition, and reject the superfluous oxygen, by the aid of light; that animals, besides these elements, devour organized bodies, of which hydrogen and carbon form the principal parts; thus, whilst animals retain azote, they reject the superfluous hydrogen and carbon, by means of respiration: and this is accomplished in the following manner. The oxygen of the atmosphere combines with the superfluous hydrogen and the carbon of their blood becoming in the first instance water, in the second carbonic acid.' He then proceeds to say, 'that the relations of vegetables and animals with the atmosphere are inverse; the first decomposing (*defont*) water and carbonic acid, the second reproducing them.' Dr. M'Murtrie has ignorantly reversed the whole arrangement of nature, by stating that vegetables reject water.

Griffith.—"The errors in the supplementary matter are not only numerous, but often brought forward *ex cathedrâ*, as if they were the *ne plus ultra* of observation in the anatomy, physiology, *and habits* of animals. At p. 32, *Reptilia, part 1,* he says, 'poisonous snakes are harmless to their own kind,' which is inconsistent with observation; for the poison of the rattle snake is not only fatal to its kind, but to itself, when accidently self-wounded. At p. 40, he says, the intestines of the tadpole are 'destined to digest vegetable nutriment;' when we know the tadpole feeds on animal food; for there is no better method of cleaning the skeletons of small animals than by employing tadpoles."

M'Murtrie.—"At page 373, is another monstrous blunder; speaking of the family cultirostres, he says, 'we subdivide it into three tribes; the cranes, the true herons, *and the swans.*' And he then proceeds to describe the grus, or crane; the cancroma, or herons, and—the swans, of course? no, he describes the ciconia, or storks; and without perceiving his previous error. We must remark, here, that if the translator had understood the French or Latin languages, he never would have translated cicognes, (ciconia, storks) into swans; and if he had had but a sprinkling knowledge of the subject, he would have known that swans belong to the great duck genus (anas L.), which his author has placed in the family lamellirostres, and not in that of cultirostres."

Of both Translations.—"Dr. M'Murtrie's translation consists but of four volumes, and is to be preferred, on this account; for there is no end to the production of the other, which has already reached the thirty-first number, and upwards of 6000 pages. This work will eventually be swelled out to forty numbers, containing at least 8000 pages, and will cost the subscribers in this country, one hundred and thirty dollars. But this cannot be fairly called a translation of Cuvier; the supplements and notes of the translator and his coadjutors, have increased the bulk of the work beyond all expectation, and have turned Griffith's version of the *Regne Animal* into a job of an indecent length, and an exorbitant expense, for which the work by no means compensates in its intrinsic value."

CHEAP FILTER.

Sir,—At the present time, when the public are inundated with a host of "Patent Water Filters," many of which are sad pieces of quackery; allow me to point attention to one on the principle of Mr. Barton's lubricator, (a description of which appeared in your Magazine a short time back, from the pen of Mr. Baddeley). Procure a garden-pot, insert into the hole at the bottom a reed or tin tube, into which put the cotton or

wool, in the same manner as in the lucubrator. It is almost needless to add, that the cotton or wool must be occasionally washed to clear it from the deposit. In filtering water, *wool* would perhaps be found preferable to cotton. A filter on that construction, would also be found very serviceable in chemical manipulation.

I am, Sir, yours, &c.
J. E.

ERRORS IN POINTING.

Sir,—The remarks of your correspondent, "A Retired Reader," (page 319) on the inaccuracy of printers, especially on the score of punctuation, are certainly very just and well founded. Every body who has ever dabbled in print, especially if he have been so situated as not to have access to the press himself—as in the case of most contributors to periodical works—must have often had his indignation roused at the fantastic tricks of the compositor, who, in the matter of pointing especially, almost seem to "make it a point" to mangle the poor writer's meaning as much as possible; a purpose which they ingeniously effect on a sort of compensation principle—in one instance putting a full stop in the middle of a sentence, and in another leaving it out altogether—running two sentences into one, and anon, splitting one into two—exchanging notes of admiration for notes of interrogation—turning an original piece into a mere mass of quotation, and, vice versa, a long extract into an original article, by the false position or the "inverted commas" (so called, although the last pair are always in their natural position)—and performing divers other tormenting transformations, "too numerous to mention," vastly to their own, and, especially, to their *reader's* disgrace, to the unfortunate author's mortification, and to the perplexity of his Majesty's lieges of the literary public.

It is not, however, merely to corroborate the charges in question, that I intrude on the pages of the Mechanics' Magazine, but to set matters "quite correct," by correcting the corrector in his corrections of the new edition of Byron. Whether your incorrigible printers—and it is not unlikely—in setting up the copy, committed the very offence, whose enormity was being reprobated before their eyes, and threw their points about quite at random, while they were composing the corrected versions of the extracts from Childe Harold, I know not; but it appears to me, that there are as many errors in punctuation in the Retired Reader's readings, as in the certainly very slovenly examples on which he animadverts. Thus, he would have stanza 53, canto 2, printed and pointed thus :—

"Oh! where Dodona! is thine aged grove?
Prophetic fount and oracle divine!
What valley echoed the response of Jove?
What trace remaineth of the Thunderer's shrine?
All, all forgotten. And shall man repine
That his frail bonds to fleeting life are broke?"

Now, admitting that the note of interrogation is properly removed from the end of the second line to the end of the fourth—(which may be questioned) —it must be allowed that a comma is wanting between "where," and "Dodona;" and that a note of exclamation (!) should follow "All, all are forgotten!" instead of a full stop. This latter point figures also where it has no business in the next instance :—

"And therefore did he take a trusty band
To traverse Acarnania's forest wide
In war *well-seasoned and with labour* tanned.
Till he did greet white Achelous' tide
And from his further bank Ætolia's worlds espied."

Here the period is certainly most improper, as where it is introduced, the sense is not yet concluded. If I had been engaged in the task of "reading" (typographically) this passage, I should not have ventured beyond a colon, which would grant sufficient pause, without finishing the sentence in the prime of its existence. A comma at the end of the last line but one would also not be amiss, although poetry should certainly be more sparingly sprinkled with them than prose.

Now for the last example, which is also the most unfortunate; the corrected reading would run :—

"What want these outlaws, conquerors should have?
But History's purchased page to call them great,
A wider space, an ornamented grave.
Their hopes were not less warm, their souls were
full as brave."

In the first line, the comma in the middle is a redundancy, which spoils the sense; and the Retired Reader is certainly mistaken in setting down the third line as an answer to the question contained in the two first: it is in fact a continuation of that question, which is answered in the asking. The lines therefore ought to run :—

"What want these outlaws conquerors should
have—
But History's purchased page to call them great,
A wider space, an ornamented grave?"

And now, Sir, hoping Messieurs the Compositors will take care to print these corrections correctly,

I remain, Sir,
Yours, *punctually*,
AN UNPROFESSIONAL READER.

Aug. 14, 1832.

[We must, in justice to *our* printers, state, that the errors in pointing which our present correspondent thinks he has detected in the "Retired Reader's" critique, were not owing to them; and in justice, also, to the "Retired Reader," we must take leave to observe, that the charge against him of blundering as egregiously as the brethren of the craft whom he criticised, is very lamely made out. The comma after "where" in the first passage may be conceded, but not certainly the note of admiration, instead of the full-stop, after "forgotten;" the one reading is, at least, quite as good as the other. In the second passage, we agree with him that a colon instead of the period would have been better. But as to the last example, which our "Unprofessional Reader" calls the "most unfortunate" of all, we differ from him entirely, and think the reading of the "Retired Reader" the true one. —ED. M. M.]

Maxima and Minima.—With respect to the two problems on the maxima and minima of geometrical quantities, referred to by our ingenious correspondent, "A Lieutenant of Engineers," at p. 332 of the last Number, Dr. Gregory informs us, that there is an erratum in each. Prob. 2, p. 398, vol. i. Hutton's Course, 10th edition, relates to a *minimum*, and Prob. 3, (which our correspondent has so well investigated) to a *maximum*. Dr Gregory also remarks, that none of the nine problems given in the specified page of the Course, are *new*, nor were they meant to be announced as such. The fact is, simply, that when the proof-sheet came to hand, p. 398 was entirely vacant, and the Doctor sent up, to fill the space, these nine problems from a paper of Exercises employed in the Royal Military Academy. Prob. 3, considered by the Lieutenant, is solved, both fluxionally and geometrically, in Rowe's Fluxions, published in 1767. We have also received a letter from "Kinclaven," in which he gives the same explanation as Dr. Gregory of the errors pointed out by

the "Lieutenant of Engineers." As this letter contains also a solution of the second problem as amended by the "Lieutenant of Engineers," we shall take an early opportunity of laying it before our readers.

Ventilation of Coal-Mines.—Sir, I beg leave to ask Saxula if his colliery is a thick or thin one? If it is a thin coal colliery, his plan of ventilation is a very bad one, because it recommends the making of several air-headings through the whole breadth of the coal, at a great expense, that he may have the pleasure to stop them up again, and immediately set about making more (see the plan, *m m*, EFG, No. 461, p. 214). Would it not be more economical to carry the air headings nearer together, and would not the ventilation be equally perfect? Again, if the colliery is a thick one, I should like to know what proportion of coal is left behind (by the way of work, as described by Saxula's diagram) compared with the whole? I should also be glad of his opinion upon another thing, and that is, how long he thinks it may be before the Staffordshire thick-coal colliers will be rummaging the old thick coal work over again, to get the pillars of coal that are left behind by the present system of working? Saxula tells us that it will be perceived he is an approver of Mr. Ryan's principle of ventilation. If he really is so, why did he not show the whole of it in his diagram, air-bags and all? The fact is this, Saxula's plan is nothing more than the old method of ventilation in the most expensive way. And all Mr Ryan has done to improve the ventilation of coal-mines has been to advise the drawing of the air-headings at the top of the thick (or ten yards) coal in Staffordshire; whereas until he so advised, those headings were usually made through the middle, and sometimes at the bottom of the coal. That, however, is no improvement in their mode of ventilation, because in those coals the whole thickness of the coal is usually worked in the air-headings; therefore, only in the thick coal collieries in Staffordshire does he improve ventilation at all. Mr. Ryan deserves credit for what he has done there, and it would be injustice to deny it to him. He has, no doubt, had to encounter a deal of prejudice; but, notwithstanding, every one who understands the buoyancy of hydrogen gas must be aware that the air-headings should be carried at the top of the thick coals, and there the whole of Mr. Ryan's system ends as far as regards practical usefulness.—I am your obliged servant, THOMAS DEAKIN, Blaenavon, Aug. 7, 1832.

LIST OF NEW PATENTS GRANTED BETWEEN THE 20TH OF JULY AND 20TH OF AUGUST, 1832.

Joshua Wordsworth, of Leeds, machine-maker, for certain improvements in machinery for preparing, drawing, roving, and spinning flax, hemp, wool, and other fibrous materials. Six months to specify on July 26, 1832.

John Jacob Parker, late of Sheffield, but now of Birmingham, Gent., for certain improvement or improvements in fountain pens. Six months, July 26.

Miles Berry, of 66, Chancery-lane, London, civil engineer and mechanical draftsman, for certain improvements in the construction of presses applicable to various purposes; communicated to him by a certain foreigner residing abroad. Six months, July 26.

Pierre Nicolas Hainsselin, of Duke-street, St. James's, architect and engraver, for a machine or motive-power for giving motive-power. Six months, July 26.

William Evatt Wright, of Regent-street, Westminster, Gent., for certain improvements in the construction, making, or manufacturing of tea or coffee urns, and other utensils of that description. *Six months, August 4.*

John Christophers, of New Broad-street, London, merchant, for an improvement or improvements in clothes' buttons. Six months, August 4.

Benjamin Cowle Tyzack, Thomas Storer Dobinson, and John Robinson, all of North Shields, for certain improvements in windlasses or machinery for winding up the cable, which they denominate Tyzack, Dobinson, and Co.'s Compound Lever Windlass. Two months, August 4.

Joseph Crawhall, of Newcastle-upon-Tyne, rope-maker, for an improvement in the manufacture of flat rope, such as is used in mines, to extend to all the Colonies and Plantations abroad. Two months, August 8.

William Newton, of the Office for Patents, Chancery-lane, London, for an improved apparatus for producing instantaneous light, and the means and mechanism to be employed in the manufacture of the same; to extend to the Colonies and Plantations abroad. Communicated to him by a foreigner residing abroad. Six months, August 10.

Thomas Wells Ingram, of Birmingham, die-sinker, for an improved method of manufacturing a certain description of buttons by the application of machinery not used heretofore for that purpose. Six months, August 15.

William Henry James, of Thavies Inn, London, engineer, for certain improvements in the construction of steam-carriages, and the apparatus or machinery for propelling the same, part of which improvements are applicable to other purposes. Six months, August 15.

INTERIM NOTICES.

"One who Lives to Learn" has observed the inquiry addressed to him at the end of last week's Magazine. He begs to say that he has incurred more publicity than he wishes by Mr. Beddeley's remarks in a previous Number. Puffing is not his object, and as his name is not in print, it must be kept back. If J. E is desirous to hold any communication, an exposition of what he wishes to obtain in drawing-papers may be answered privately.—London, August 21, 1832."

G. D. of D. N. will please to consider himself exempted from the general rule to which the postscript of his last letter refers. We shall always be happy to hear from him.

A wish to serve "A Constant Reader" induces us to recommend to him to address the botanical inquiry he has sent to us, to the "Gardeners' Magazine," through which he is more likely to obtain a speedy answer.

We think very highly of the paper with the motto from *Le D. B.*, and should be glad to know how we may communicate with the author, respecting some alterations in point of form, which we think would make it better suited to our pages.

Communications received from I. L.—A Country Rector—Φ. M.—Zeno—A Constant Reader—Kinclaven—Mr. N. Logan—A Westminster Scholar—L. S.

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No. 473.] SATURDAY, SEPTEMBER 1, 1832. [Price 3d.

DICKSON'S PLAN FOR PURIFYING THE SMOKE PRODUCED BY SMELTING COPPER ORES.

Fig. 1.

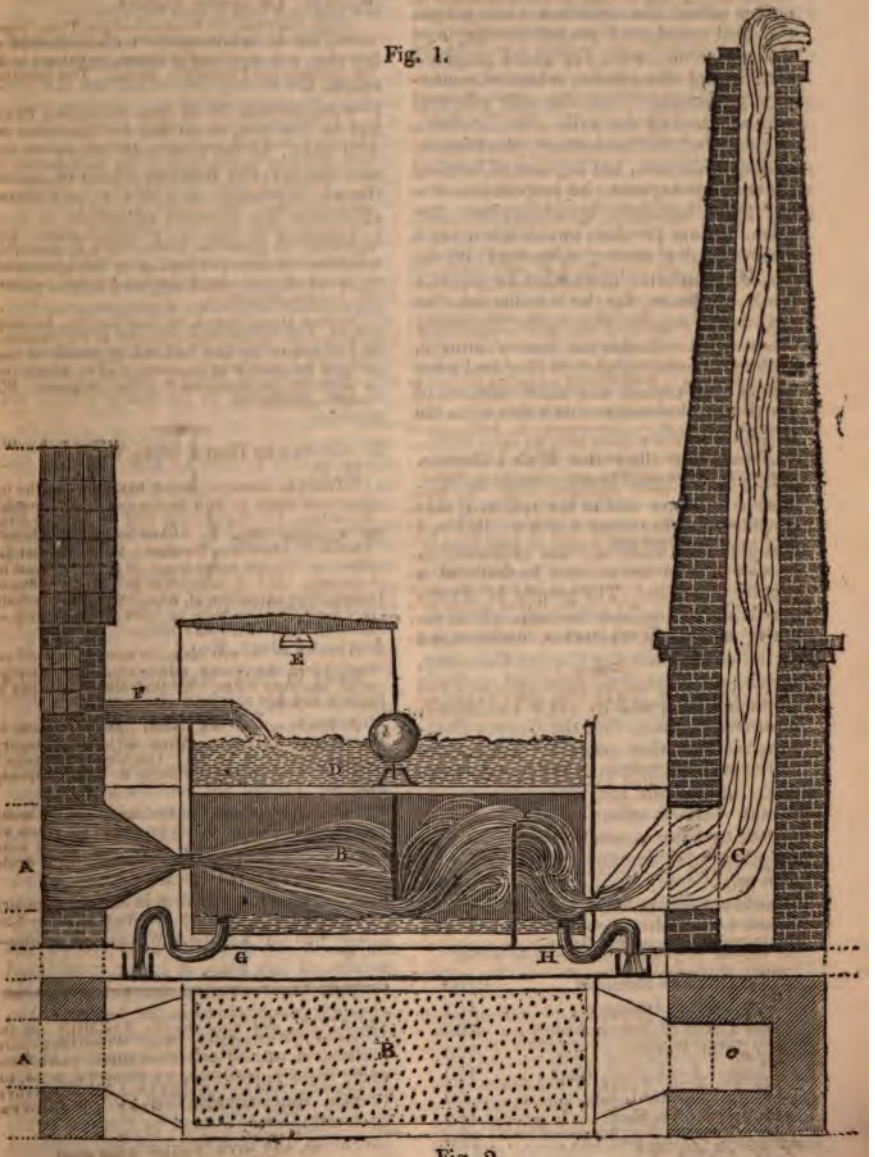


Fig. 2.

MR. DICKSON'S PLAN FOR PURIFYING THE SMOKE PRODUCED BY SMELTING COPPER ORES.

Many of the readers of the Mechanics' Magazine will, no doubt, remember that about the year 1820, there was a great outcry about the nuisance arising from the foul smoke of manufactories, and that numerous were the plans proposed for burning the smoke, which was commonly thought to be the only effectual way of abating the evil. Mr. Dickson, engineer, of Holland-street, Southwark, had also his plan, but in place of *burning* the noxious vapours, he proposed to render them harmless by *absorption*. Besides feeding the fire by machinery and dispersing the smoke, as several did do, Mr. Dickson introduced what he called a *smoke-condenser*, for he considered that coal-smoke was less obnoxious than many other vapours discharged from chimneys, such as arsenic, sulphur, salts, and even copper and lead, in a rarefied state, all of which are destructive both to vegetable and animal life.

About this time the Hafod Copper-works at Swansea became such an intolerable nuisance to the town, that it was considered either those works (which had cost about £150,000) must be removed, or else a new town must be built at a greater distance. The people of Swansea thought they had the best right to remain, and they, therefore, commenced an action against the Copper Company, which, of course, was defended, and put off as long as possible. It is but justice, however, to state, that the Copper Company did all they could to remedy the evil complained of, and spent many hundreds of pounds for that purpose, although without effect. It was, at last, agreed to raise a sum of money by subscription "for remunerating any person who might completely obviate the inconvenience arising from the smoke produced by smelting copper ores." The following is a list of the subscribers:—

The Duke of Beaufort	£100
The Earl of Jersey	100
The Lords of Neath Abbey . .	100
Sir John Morris	100
Thomas Lockwood, Esq. . . .	100
George Tennant, Esq.	50
Henry Smith, Esq.	100
Messrs. Vivian and Co.	100
J. H. Vivian, Esq.	100
Corporation of Swansea . . .	200
W. H. Vaughan, Esq.	10
Henry Socket, Esq.	5

After the above subscription, a meeting was held at the Town-hall, Swansea, John Charles Collins, Esq., Portreeve, in the chair, when it was resolved:—

"That it is the opinion of this meeting that a reward of £1000 shall be paid out of the money subscribed for the purpose of getting rid of the noxious qualities of the copper-smoke, to that person who shall, in the most satisfactory manner, destroy the noxious qualities upon the whole process, and at the same time effectuate the greatest reduction of the bituminous smoke, and upon the plan adapted to the present practical operations of copper-making, and at the most reasonable expense; the success or failure of the candidate for the premium to be judged of by the following gentlemen, or any three of them; the adjudication of the premium to be made within six months.

D. Gilbert, Esq. M. P. } Vice-President of the Royal Society.

W. Nichol, Esq. } Chairman of the Quarter Sessions of the county of Glamorgan, F. R. S.

Lewis Weston Dellwyn, Esq.
William Crawshay, Esq.
Anthony Hill, Esq."

Early in 1821, Mr. Dickson took out a patent for his method of abating all such nuisances. During that year several gentlemen called on him who were well acquainted with the business at Swansea, and Mr. D. did not hesitate to give them the fullest explanations of his plan. Not long after he was informed that the Hafod Copper Company had, without any leave from him, adopted it, and found it to answer perfectly. His first intention was to apply for an injunction against the Company, but he was advised to rest on the merits of his plan, it being considered that as there were so many respectable characters concerned in the business, Mr. Dickson could not fail to obtain, ultimately, a suitable recompense. However, time passed on, and he heard, at length, that though the nuisance had been completely abated by the use of his invention, the money raised was returned to the subscribers, as Messrs. Vivian & Co.

(the Hafod Company) would not accept of any reward, and did not choose to point out to whom the merit of the achievement was really due.

To satisfy the public that Mr. Dickson's plan is identical with that adopted by the Hafod Company, we shall first extract his own account of it, as contained in his specification:—

"I apply (he says) a vessel made of iron or other materials so as to contain *water*, which vessel, or chamber, I call a *smoke condenser*, soot-collector, general absorber, or any other name that the use to which it is applied may suggest. This vessel, or cistern, I make of any size or shape, according to circumstances, and I place it between my boiler, or vessel, and its chimney, used for the purpose of heating water or other fluids, or between any furnace, or stove, and its chimney, used for smelting or calcining ores or metals, or any substances whatever. In this said vessel, or cistern, is retained a quantity of water, and it has openings at each end nearly equal to the area of the flue to which it is applied; the height of these openings or passages is very small compared with their horizontal measurement, so that it causes the current of rarefied air and smoke to enter in a thin horizontal sheet or stream. At the same time I cause one or more *showers*, *streams*, or *sheets* of water to fall perpendicularly or otherwise from the top part of the cistern, or from the cover of the chamber or flue, or by any mechanical means, I produce jets of water to play into the current of rarefied air and smoke, (and whatever it may be impregnated with), which passes through one or more showers, streams, sheets, or jets of water, which will extinguish all the firy sparks and deprive it of the sooty and other noxious particles, such as arsenic, sulphur, salts, or metals, in a rarefied state. And when circumstances require it, I also cause the smoke to pass through a certain depth of water in the said cistern, or vessel, by means of placing a plate or false top inside, under which the current of rarefied air and smoke passes; one end of this plate is lowered near to or into the water in the said cistern, or the water is caused to rise near to or above the said plate, to any height required; and to assist the draft, when necessary, I cause a large space at, or near the chimney, to be partially exhausted of the air, by any mechanical apparatus applied for that purpose, or by rarefying the atmospherical air in the said space by means of heated pipes or otherwise in the common way."

The engraving on our front-page represents a smelting-house, constructed according to Mr. Dickson's plan. Fig. 1 is an elevation; fig. 2, a ground-plan. The same letters refer to the same parts in both figures. AA is a flue, coming from any boiler or furnace used for the purpose of smelting or calcining ores and metals. BB is a cistern or chamber, which the smoke enters in a thin horizontal sheet or stream, and is nearly kept in that form until it enters the chimney CC. D is a cistern (over the chamber), containing water, which produces a constant shower (in the chamber), through which the smoke passes, and is caused to ascend and descend therein. E is an apparatus, consisting of a sluice, lever, and floating-ball, which regulates the supply of water required for the shower-chamber. F is a pipe, or trough, to conduct the water to the cistern; and G and H are two syphon-pipes, to discharge the water from the shower-chamber, which always retains a quantity at the bottom. In the shower-chamber soot may be collected by the cart-load, and quantities of arsenic, sulphur, salts, metals, &c., in various forms, according to the nature of the process carried on.

The Hafod Company, it is understood, plead ignorance of Mr. Dickson's patent. However, every body knows that ignorance of the law will not excuse the violation of it. It may be possible, but is certainly very improbable that the following striking coincidences could happen without any communication between the parties, directly or indirectly. In a "Statement," published by Messrs. Vivian of the measures taken by them "to do away with the inconvenience arising from copper smoke," (Swansea, 1823), they state that they made their first experiments in 1820, but that they then encountered difficulties which "appeared almost insuperable."—"In the month of March, 1821," however, that is, after Mr. Dickson's patent had been taken out, "the trials at Hafod were *resumed*, and on a scale that was *certain* to lead to decided results. * * * The *stack* was begun in May, and finished in July, 1821. * * * The *water was introduced into the flue* by iron pipes laid across the bottom, and communicating with a range of pipes from the canal. * * * In August, 1821, this flue was so far completed, that the ten calciners in the main building were turned into it, and the result was

highly satisfactory; the volume of smoke was very considerably diminished, and the nature of that which passed off from the high stack was most materially altered, as the great deposit in the bottom of the stack and on the side of the flue evidently proved; added to this, the *water* that was thrown into the flue, and chamber, was highly impregnated with the substances abstracted from the smoke;* and, indeed, persons who had opportunities of breathing the smoke from the stack, when distinct from that of other works, pronounced it to be no longer in any material degree offensive. * * * This plan of introducing the water was, however, in practice incomplete; for although we had a head of 12 feet, the water, owing to the great length of pipe from the canal, the smallness of the bore (it being only 3 inches in diameter), and the numerous angles it had to pass through, had lost so much of its momentum, that it did not ascend with that force which was required to produce the intended effect. It was determined, therefore, to adopt the form of a *shower-bath*, admitting the water into the top of the chamber and flue, through a copper pan, pierced with holes, and thus insuring its regular distribution."

The two plans are, in short, precisely the same. Of this Mr. D. still further satisfied himself by personal inspection of the Hafod Works in 1823. Shortly after this he went abroad, and has only recently returned to England. On his return, he applied to the Hafod Company, but, we regret to learn, without obtaining any recompense for the important services which his invention has rendered to the Company and the town of Swansea, as well as to the public at large.

[We publish the preceding statement, which has been furnished to us by a friend of Mr. Dickson's, in order that the public may be made acquainted with Mr. D.'s claims to the invention of one of the most important improvements introduced into the arts during the last twenty years; but we do not wish to be considered as responsible for the accuracy of the statements it contains, or the fairness of the charges which they imply.—Edit. Mech. Mag.]

* The substances so deposited in the flue and chamber were afterwards analyzed, and found to contain various portions of arsenic, sulphur, various acids, bases, metals, and different compounds, &c.

MODERN DRAWING-PAPERS AND WATER-COLOUR PAINTING.

Sir,—It appears that my observations on drawing-papers, in No. 463, of your Magazine, are not exactly intelligible to several of your correspondents (see pp. 239 and 262), particularly to Mr. Baddeley; for their information I beg to explain by a few more observations.

As regards the *transparency* of paper, I did not mean, nor did I think, I should be understood to mean, its appearance when held before a window; nor the thinness of the paper, by seeing the light through it. Such a transparency, I allow, exists in the present papers, and is more injurious than beneficial, for it is owing more to the size than any thing else in it. But surely I may speak of the transparency or opacity of substances as they lie before me, without any great abuse of terms. Cannot the transparency of a piece of gypsum, for instance, and the opacity of a piece of chalk, be discerned without holding them up to the light? Connoisseurs do not pronounce on the "transparency" of a picture by viewing it in such a position.

The "difference between linen and cotton fibres" seems "hardly comprehensible" to Mr. Baddeley. How I would ask him, "reasoning on optical principles," would he tell the difference between a piece of linen and a piece of calico, but by the difference in "fibre," "filament," "texture," or whatever he wishes to have it called? Which difference, let it be observed by the way, constitutes the difference between good and bad paper.

Then the "shortness of filament" in paper Mr. B. cannot "exactly comprehend." I would ask him if he can trace any *length* in it by simply tearing a piece of common drawing-paper and examining its edges, or masticating a small piece into pulp again. I confess, it appears to my view as if the filaments were ground to powder. Old paper tears differently, and if Mr. B. will be at the trouble of tearing a piece of linen and a piece of calico he will find a similar difference in the length of filament.

On reference to the Encyclopædia Britannica, art. "Paper," it will be seen with what care the paper-makers of Holland selected and sorted their materials and *preserved* the filament, even to the taking out "of hems, sewing-threads, knots, &c.; but here every kind of stuff,

by bleaching and machinery to grind it, can be made into pulp. The rag-gatherer bears witness to this; he no longer sets a higher value on linen than on cotton rags.

I beg to state again, that the roughness or abraded surface of drawing-papers, which merely assists the even distribution of colour, is not an essential quality; at least, I have never had reason to complain of the want of such a surface. Nor is the extreme whiteness of the paper an essential when used for paper; mere whiteness will not represent light any more than black paint will shadow; and I will maintain, that if, as is commonly taught, shade be required to be "transparent"-light, every part of a picture requires it, and the greatest distance, and not the foreground, as is also taught, requires it in the highest degree.

Many think that if the colour lies evenly on the paper, and the tints (as regards their *colour only*) are exact to nature, all that is necessary for good colouring is thereby gained. I think differently, and for these reasons:—A landscape—a scene in nature I mean—is represented by imitating the forms, light, shade, colour, and, I add, the *distance or space* between the spectator and the objects which are comprised in it. Now, this last requisite in a picture is not gained by linear perspective alone, for the greater part of objects in a landscape, indeed, in any pictures but architecture, cannot be expressed by mathematical lines; nor is it gained by aerial perspective, or a judicious gradation of colours in imitation of the colours of illuminated air or haze; for, in many instances, particularly looking northwards, that effect cannot always be seen, and not at all in a close or near view. And as a proof, there are hundreds of pictures to be seen where these perspectives (of *lines* and *colour*) are managed with the greatest exactness, yet shall the connoisseur pronounce them "hard," "cold," "insipid," and "flat." The term "flat," let me observe, expresses the absence of distance, depth, or space, and not of perspective, linear or aerial. Then how, it will be asked, is this imitation of space or distance gained in painting? I answer, by the diaphonous surface of good paper in water-colour drawing, and a similar quality in the vehicle for oil-colours; these alone give the depth or distance of colour—air to *the picture—and cause it* to appear "as if you could walk through its frame amongst its scenery." In short, the less of tangibility, of hardness, or of flatness, there is in the *surface* of the paper or paint in a picture, the more complete the representation. This quality or depth all artists seek to obtain—the oil-colourist by vehicles, "glazing," "scambling," &c.; the water colourist by "sponging" and "scraping," thereby softening the appearance of the paper, and mixing the colour with the fibres, which he cannot otherwise do; the miniature-painter, by "hatching," or "stippling," so as to show a touch of one colour between or through touches of another colour; and the engraver, by showing the white paper between his lines, and by the quality of his ink, and who gets his depth or distance in a better manner by these means than any other artist whatever, although in black and white only, for a proof of which you have only to *try* to imitate his distance in mezzotint, Indian ink, or colour. Indeed, without this quality of depth, softness, or distance in colour, objects in a picture would look like small models, and defy the imagination, however exquisite, to enlarge them to their natural appearance.

Oil-painters do not use different *vehicles*, because of the facility they offer in *working*, but because of the different appearance they give to colour. Observe the difference given to paint in using turpentine, oil, varnish, guilp, wax, &c.; this is caused, I apprehend, by their different powers of refracting light, but to trace out the cause would lead into the labyrinth of chromatics, (to an article on which, and for some curious information, I beg to refer to the Encyclopædia Brittannica*). Now, what are cotton, linen, wool, and silk, but vehicles, as it were, for colours, in dyeing? And observing the difference in depth and brilliancy of colour in those substances respectively, I would ask whether it does not depend on the difference in transparency of the fibres in each, the least colour being in the most

* It is a fact, that the water-colourists now-a-days use all the opaque and ponderous colours, as India red, cobalt, lamp-black, ochres, &c., from their approaching to the softness of stencil colour, the vehicle of which is the air (some say from their durability those colours are used), while all the transparent or gummy colours, which were formerly used with such beautiful effect of staining, are almost entirely discarded on account of their inapplicability to the modern paper.

opaque substance—cotton—and the deepest in silk, the most transparent?

It is not expected nor wished that the artist should have paper enabling him to produce colours, vying with the clear depth and richness of silk; but he does expect and require paper to produce colouring better than that in common calicoes at least, and a better article than that which gives no deeper colour in water, than as if it were laid on a white board, or on earthenware.

I may here mention, that all that is wanted in depth of colour, in oil and water painting, has been produced over and over again, and is still produced—but by a few now—and by means only of good paper in water-colours, and a good vehicle in oils—and I could show old and modern drawings, the comparison of which, would soon prove the inferiority of our present paper.

I hope Mr. B. now "exactly comprehends" the "difference between linen and colour fibres," and I also would "suggest" to him, that an hour spent in an artist's painting-room would not be thrown away. I repeat again that paper used for landscapes and large pictures,* should have *longer* filaments in it, for that would enable the pigment to pass into the paper, there being larger interstices in consequence; and it should have *transparent* filaments, for that would enable the light to pass also.

I remain, Sir,
Yours, respectfully,
J. E.

Derby, Aug. 12, 1832.

SMOKY CHIMNEYS.

Sir,—I have not for some time read any thing with greater pleasure than the judicious remarks of C. D. S. (p. 316.)

An association of architects for the purpose which he suggests, commencing on scientific principles, would doubtless have but little difficulty in devising objects more sightly than, and equally efficient with, those at present in use, for the cure of smoky chimneys.

All those who have any pretensions to order and taste, must, in common with your correspondent, have felt disgusted with the general means employed to eradicate the evil in question; and every one who loves to breathe the pure air, and knows the value of it, should do his utmost to forward the suggestions alluded to; as the result would not only be highly gratifying to those who can appreciate the beauty of judicious architectural forms, but also beneficial to those who have no just conception of the value of untainted air.

In the present enlightened and enquiring age, we must not, however, rest satisfied with merely ascertaining in what way the annoyance can be got rid of; but we must also know the fundamental cause of the existing evil, as well as sufficient reasons why a chimney-pot is calculated to effect a cure. This is the true way to proceed to arrive at a favourable conclusion; and unless a society start upon those principles their labours will prove unsatisfactory.

It may be said, that, "the means and experiments employed to effect a cure, will at the same time disclose the cause;" but this may not be the case. Indeed, to know the cause of the good or evil we daily experience, is a point, I am sorry to say, that we trouble ourselves very little about. We know from experience that certain agents produce certain effects; so we generally take things for granted, without ever inquiring into the nature of the operation. The bricklayer puts up a chimney-pot to cure a smoky flue, upon the same principle that the apothecary's patient swallows physic, in hopes of a certain result; namely, because they know that the same means had in former cases produced the effects they now wished for. But we must know the "why" and the "wherefore," before we can be said to know much about the matter.

In recommending the foregoing as the fundamental principles to be observed by a society for the laudable purpose that your correspondent suggests, I shall here subjoin my own humble opinions on the matter of smoky chimneys; which I do with due deference to those who have had more experience, and paid more attention to the subject than myself.

To define the particular cause of a

* The depth of colour is produced on card-board and ivory (chiefly used for flowers and miniature-painting), by other means than by a flat wash of colour, as I have before hinted.

smoky chimney, unless some individual cause were pointed out, is utterly impossible. We all know that the best constructed flues are liable to smoke occasionally in bad weather, when the density of the atmosphere is less than in fine weather; the reason is, that when the specific gravity of atmospheric air is reduced and approaches nearer to that of the smoke, the latter cannot ascend so freely; because the weightier the atmosphere the more rapid is the ascent of the smoke, on the same principle that a current of water passes an impediment with greater velocity, than where it has no obstruction. This cause, however, seldom occurs, which is as well, as we can never overcome it: the chief causes are the following:

Flues that are not properly *drawn in* immediately above the fire-place, are liable to smoke; because a wide opening may contain more air than the fire can properly rarefy; which, therefore, passes on to join the air of the room, carrying the smoke with it; while, on the other hand, flues that are narrow at the throat not only obviate this, but a smaller cavity opening into a wider one, creates, of course, a greater current. Chimneys which are built in sheltered situations, are liable to smoke for want of a free circulation of air round the chimney tops: this, however, I shall presently explain more fully. Flues that are not properly pargeted or plastered inside, are also liable to smoke; because the air penetrates through the porous nature of the bricks, as well as between them when the mortar is decomposed. Square or parallelogram flues are very bad forms; because smoke always ascends in a circular column, and therefore the angles of these forms serve as receptacles for cold air. When the divisions between the flues are very thin, the consequence is also bad; because, occasionally, the chimney of the next flue may have no fire on, and, therefore, the cold air penetrates through the thin divisions. The preceding deficiencies, with other topical circumstances may be considered the chief cause of smoky chimneys.

A chimney that smokes from any of the foregoing defects, or from any other cause whatever, and is cured by a chimney pot, would, in the event of the chimney pot being removed, and the stack of chimneys carried up in a body, even as high as the loftiest "tall boy," again return to smoking; because, it is not the additional height that effects the cure, but the freer circulation of air round the openings of the flues. When a number of flues are built in one chimney stack, as is the case with street houses at present, it is obvious that a current of wind (which generally passes in a horizontal direction), when interrupted by a broad mass of building, rises perpendicularly to the top of the impediment, and then resumes its horizontal direction; so that, in passing over the flues, it not only prevents the free exsurgence of the smoke, but frequently finds its way down into the flues. The chimney-pots, on the other hand, divide the current of the wind, which has a free passage between them. Since, therefore, chimney-pots cannot be avoided in certain situations, and with certain connected circumstances, it behoves architects to devise proper architectural forms, suitable for the buildings to which they may be applied, to supersede the disagreebly-coloured and unshapely forms at present in use.

I intended to send you along with this, outlines of forms for chimneys, characteristic of the different styles of architecture; but not knowing how far they might be agreeable to the plan of your work, I have deferred it for the present.*

In conclusion.—Well constructed *circular* flues, with *sweet* windings or turns; well drawn in at the throat, and properly pargeted or plastered, brought together as much as possible for the sake of heat, and carried up in one body to the roof; placed in the internal walls; the chimneys carried up to a moderate height above the roof, with openings between the shafts; the coping bevelled outwards to serve the double purpose of throwing off the rain, and conducting upward the transit of the smoke; will scarcely fail to vent well in any situation.

I remain, Sir,
Yours very respectfully,
R.

Bayswater, Aug. 20, 1832.

* We shall be happy to give insertion to the plans of our correspondent, or to any others with which we may be favoured, for the improvement of this important feature of architecture.—Edit. M. M.

FACTS FROM WHICH ARE DEDUCED THE PROSPECTIVE ADVANTAGES OF THE LONDON AND BIRMINGHAM RAILWAY.

(Condensed from the Evidence adduced before the House of Commons.)

I. Commerce.

Population of Birmingham and the environs is 142,250.

Every branch of its manufactures goes to London.

The delays and stoppages by the canals have been found of the greatest inconvenience.

Much pilferage occurs, and packages often broken into to ascertain nature of goods.

A speedy conveyance of goods for shipment is of the very highest importance, so much so, that light goods are often sent by coach at very increased charge.

The opportunity of sending them by a particular ship is frequently lost by the present delays of conveyance.

Intercourse with Manchester would be increased, as the traders there now go to Liverpool for many things, which, if there were a railway, they would come to London for.

Speed and certainty of conveyance, of advantage to the Port of London.

The trade with Coventry in ribbons, and with Manchester in light fancy goods, is very great. These are all sent to London by coach or van to save time. The charge from Coventry is 2d. per lb. From Manchester it is from 16s. to 20s. per cwt.

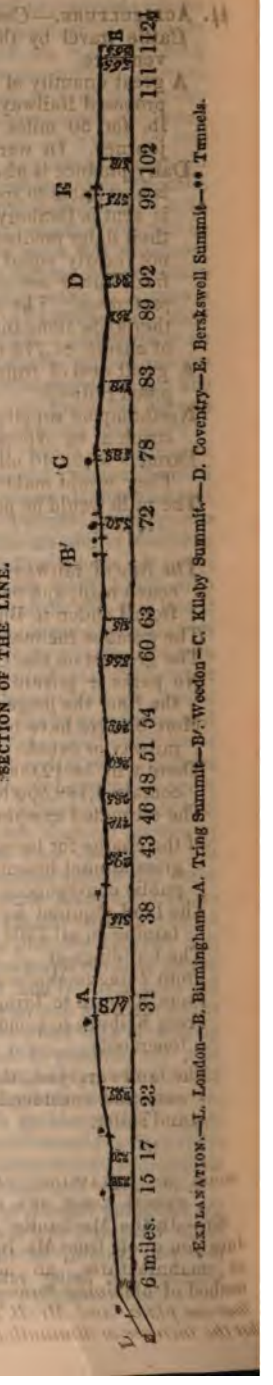
Speed is of great importance to the book trade, in the conveyance of publications and periodicals of all sorts.

II. Agriculture.

The Railway would afford advantages as well commercial as agricultural to Leicester and the adjoining districts.

A vast number of graziers are in the habit of attending Smithfield market weekly from Lincolnshire, Northamptonshire, &c. Their journey to and fro, occupies them two days and nights. The expense of travelling is one guinea each way, besides extras.

From 15 to 1700 head of beasts are driven up to London weekly from the country, between Hockliffe and Coventry; besides a vast quantity of sheep and pigs. The beasts are on an average 4 or 5 days and nights on the road—the sheep 8 or 9. The expense of driving is 7s. per beast. Cattle lose much both in condition and quality by driving. If driven 100 miles, will frequently take 4 or 5 months to recover their condition; 20 beasts, at the least, out of the 1500 driven up, are left on the road, unable to proceed through fatigue. Pigs would be sent in greater abundance; they now suffer much by fatigue. Young lambs and calves *cannot now* be sent at all from a distance.


SECTION OF THE LINE.
A
B
B'
C
D
E
6 miles. 15 17 22 31 38 43 46 48 51 54 60 63 72 78 83 89 92 99 102 111 112½
EXPLANATION.—L. London—B. Birmingham—A. Tring Summit—B'. Weedon—C. Kilsby Summit.—D. Coventry—E. Berkswell Summit.—** Tunnels.

II. AGRICULTURE.—*Continued.*

Cattle travel by the Liverpool and Manchester Railway without any inconvenience.

A great quantity of meat is sent up to London from the country, adjacent to the proposed Railway. It is conveyed by waggons at an expense of about 1d. per lb. for 50 miles. The waggons are two days and nights performing the journey. In warm weather the meat often spoils before it reaches London.

Dairy produce is also sent up by coach and waggon in large quantities. This is also liable to spoil in warm weather. The most distant place from which it is sent is Banbury. The expense and risk deter many farmers from sending their dairy produce to London. The supply of English butter in London is not nearly equal to the demand. Many thousand dozens of lbs. of Dutch fresh butter are sold weekly in London. The English butter always has the preference. The average quantity of butter annually imported from the Netherlands alone into London, during the last three years, has been 90,416 cwt.; of cheese, 81,773 cwt.; and 4,820,278 eggs.

A great deal of fruit is sent to London from the country contiguous to the proposed railway.

Northampton supplies London with a vast deal of asparagus; it is sent by coach at an expense of about 4d. per 100 head.

Farmers living 40 miles from London could send milk and cream by railway, They would make by this 500 per cent. more than by selling butter.

The milk would be purer and better than what is now sold in London,

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ESTIMATES.

The line of railway is 112¼ miles long. It is only 4 miles longer than the direct coach road, and only 7 miles longer than the shortest line that could be drawn from London to Birmingham.

The greatest inclination from a level is 16 feet in a mile, or one mile in 330.

The greatest on the Liverpool and Manchester line is one in 96.

No parks or private grounds are interfered with. There will be 10 tunnels on the line, the longest 1¼ mile; the shortest 350 yards.

More bridges have been allowed for in the estimate than on any other existing railway or canal, in proportion to the length of the line.

There will be 12,000,000 cubic yards of excavation. The embankments will contain 1,168,500 less. 1250 acres of land will be required.

The estimated expense of completing the work is £2,500,000.

If the charge for travelling on the Railway be two pence per head per mile, the gross annual income of the Railway from passengers only who now go by public conveyances will be £246,916. 16s.

The land required for the Railway between Wolverton and Birmingham, containing in all 710¾ acres, has been valued at - - -	£89,436
The buildings at - - - - - -	11,440
From Tring to Wolverton, 214 acres, are valued at - -	16,165
From Kilburn to Tring, 345 acres - - - - -	63,794
From Kilburn to London, 43 acres, including 20 houses and 11 small tenements - - - - - - -	65,841

The land surveyors state the price they have affixed to be a very high one, and considerably beyond the usual valuation between buyer and seller.

MODE OF OBTAINING VARIOUS-SIZED PRINTS FROM ONE PLATE.

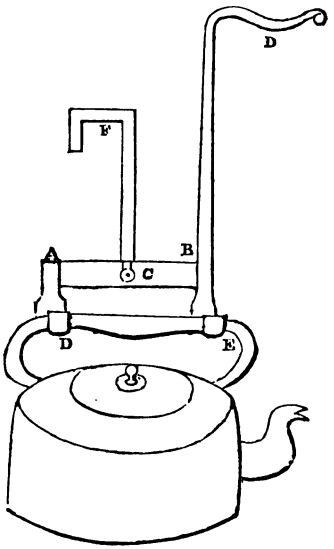
Sir,—In the Mechanics' Magazine for une you quote from Mr. Babbage's book n manufactures, an account of a ıethod of obtaining *various-sized* prints *om one plate, and Mr. B.'s* suggestion *t the increase or diminution* of surface on a fluid in a cone was the means employed by the ingenious inventor. For the better information of your readers I beg to state, that at the time the various prints were handed about in London at the different Societies, it was confidently stated that the following or similar means were had recourse to:—An elastic plane,

made of a mixture of glue and *treacle*, was fixed in a frame, capable of being regularly expanded on all sides by screws. On this elastic plane an impression was delivered from the copper-plate; and if immediately transferred from the plane to paper, would, of course, be the exact size of the plate employed. If after taking the impression from the plate, the plane was stretched by the frame and screws, the print when taken on the paper would have a similar increase of size. When it was required to strike an impression LESS than the original plate, the plane was *first stretched*, the copper-plate impression made on it, the screws were relaxed, and when the plane had equally contracted, the transfer was made on paper, and the print, of course, was smaller than the plate.

Many of your readers are, doubtless, aware that straps of this flexible compound of glue and treacle are used for printing patterns, &c., on mugs and other circular articles of pottery, by transferring the impressions from a copper-plate.

I remain, Sir, yours, &c. T. D. L.

IMPROVED KETTLE-HOLDER.



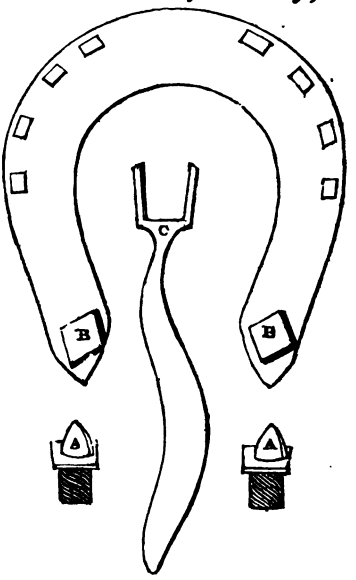
Sir,—AB is a slender bar of iron, or strong piece of hooping. AD, BE are *hooks* of equal size fixed at A and B; *but EB is prolonged* upwards to D, where *it is turned off* square to form a handle. *F is a hook,* admitting of being turned freely round its centre-pin C. The hook F is hung on across the pot-hook, and the kettle on the hooks DE; there is also a spring, which is welded on AB, and entering the mouth of the hook E, prevents the kettle from slipping. The operation then is to draw the handle D towards you, when the water will be steadily discharged without giving you any chance of scalding or burning your fingers. The contrivance is so simple and cheap, that I have no doubt any blacksmith would make it for two or three shillings.

It will at once appear, Mr. Editor, that this is an useful kitchen utensil, and as such, I feel assured, that its description will not be denied a place in the pages of the Mechanics' Magazine.

I remain, Sir, yours, &c. G. J.

IMPROVED HORSE-SHOE.

(From the Voice of Humanity.)



Sir,—I was lately travelling in a coach, early in the morning; it was one of those mornings which are so distressing to smooth-shod horses. In the night there had been a considerable fall of sleet, with a little rain, and this fall was immediately followed by a very hard frost, so that the road was one complete sheet of ice. Coming on so suddenly, there was no time to get the horses rough-shod, and their consequent suffering was great. They were down and up, first one and then another, all the way.

In order to get up one little hill, all the passengers were asked to get out and off from the coach, and even then it was with the greatest difficulty that the coachman could force the horses up. He was obliged to "lash them into madness;" sometimes two were down together, and once all four were down at the same time, and when they had scrambled to the top, they were in a pitiable state of exhaustion, the sweat literally running from them as though warm water had been poured on their backs, although so cold a morning.

It struck me at the time that it would be easy to make horse-shoes which might be turned up, as it is termed, in a few minutes. I send to your appropriate publication a drawing of the sort of shoe which I have invented.

The two steel nuts marked B are made barely a quarter of an inch high, about one-eighth and a half, and worn in the winter when the roads are not slippery. When the frost comes, and you wish the horse turned up, or more properly speaking, rough-shod, you take out the two nuts marked B by means of the spanner marked C, and put in the two steel nuts marked A. The whole is done in a few minutes. Mr. Holmes, the veterinary surgeon of this town, has lately shod some horses in this way, and it answers well. When the groom or ostler picks his horses' feet every night, he should at the same time take out the nuts, put a little oil or grease to them, and screw them in again tightly; this is to prevent their getting fastened by rust. There should always be a little store of nuts, that as they wear down they may be replaced; and they must not be permitted to wear down lower than that state in which they can be turned out by the spanner. The prevention of the very injurious effects upon the feet of horses by their shoes being taken off and turned up (often required from frost in a day or two after they have been newly shod) is worth consideration to say nothing of its being done in haste and the foot often pricked.

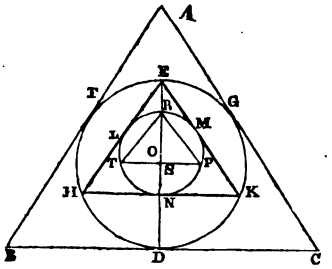
Above all this, rational humanity and kindness to those docile, useful, and noble animals, should be our main object. Let them ever be considered as gifts from the Almighty Creator, for our use and comfort, and let them ever be treated with gentleness. Indeed, I believe they are seldom ill-treated but by men of vulgar minds, unthinking or uneducated; or, if educated, their education not based on Christian principles, and, without that *base, I hold all education* defective, if not *mischievous.*

I remain, Sir, yours, &c. T. P.

Birmingham, Feb. 9, 1832.

SOLUTION OF THE 6TH MATHEMATICAL QUESTION, VOL. XVI., P. 187.

By an Oxford Student.



Question—Suppose the greatest sphere is inscribed in a given cone, and the greatest cone prescribed in this sphere, and the greatest sphere incribed in this last cone, and so on to infinity. Find the solidity of all the inscribed spheres and cones.

Let ABC be a triangular section passing through the axis of the cone, and DGF, a section of the inscribed sphere, and draw the diameter ED. Since the three sides of the triangle ABC are given, the diameter ED is known. Let $ED=a$; also let EHK be a triangular section of the greatest cone that can be inscribed in the sphere DGF. Assume $EN=x$, $\therefore ND=a-x$. Let 3.14159, &c. $=P$. Then $HN^2=ax-x^2$, $\therefore$ the content of the cone $EHK=\frac{Px}{3}(ax-x^2)=$ max. or $ax^2-x^3=$ max. $\therefore 2axx-3x^2x=o$; hence $x=\frac{2a}{3}$, that is, EN is double ND.

In the same way, if LMN be a sphere inscribed in the cone EHK, and RTP the greatest cone inscribed in this sphere: RS will be double SN; and so on: and, evidently, all the inscribed cones will be similar. Let o be the centre of the circle LMN, then, by a well-known theorem, $ON\ (HE+EK+HK)=HK\cdot EN$, or, $\left(\frac{2a}{3}\sqrt{6}+\frac{2a}{3}\sqrt{2}\right)ON=\frac{2a}{3}\left(\frac{2a}{3}\sqrt{2}\right)$, from which $ON=\frac{a}{1\frac{1}{2}(\sqrt{3}+1)}\therefore RN=\frac{a}{\frac{3}{4}(\sqrt{3}+1)}$. As-

sume $\frac{3}{4}(\sqrt{3}+1)=S$, then $RN=\frac{a}{S}$. In

the same way the diameter of the next inscribed sphere will be $\frac{a}{s^2}$ ∴ the diameters of all the inscribed spheres will be $a, \frac{a}{s}, \frac{a}{s^2}, \frac{a}{s^3}$, &c., to infinity, and consequently, the content of all the inscribed spheres will be $\frac{Pa^3}{6}\left(1+\frac{1}{s^3}+\frac{1}{s^6}+\frac{1}{s^9}\right.$ &c. ad infinitum). But the sum of the infinite series $1+\frac{1}{s^3}+\frac{1}{s^6}+$&c. $=\frac{s^3}{s^3-1}$ ∴ The content of all the inscribed spheres will be $\frac{Pa^3}{6}\left(\frac{s^3}{s^3-1}\right)$. Again, $RS=RN-SN=\frac{a}{s}-\frac{a}{3}=\frac{2a}{3s}$. Hence the axes EN, RS, &c. of the inscribed cones will be $\frac{2a}{3}, \frac{2a}{3s}, \frac{2a}{3s^2}$, &c.; also $HK^2=\frac{8a^2}{9}$. The content of the cone $HEK=\frac{P}{4}\cdot\frac{8a2}{9}\cdot\frac{2a}{9}=\frac{4Pa^3}{81}$. And similar solids being to one another as the cubes of their like sides ∴ $\left(\frac{2a}{3}\right)^3 : \left(\frac{2a}{3s}\right)^3$ or $1:\frac{1}{s^3}::\frac{4Pa^3}{81}:\frac{4Pa^3}{81s^3}=$ content of the cone RTP ∴ The content of all the inscribed cones will be $\frac{4Pa^3}{81}\left(1+\frac{1}{s^3}+\frac{1}{s^6}+\right.$ &c., *ad infinitum*) $=\frac{4Pa^3}{81}\left(\frac{s^3}{s^3-1}\right)$. Hence the solid content of all the inscribed spheres and cones will be

$$\left(\frac{Pa^3}{6}+\frac{4Pa^3}{81}\right)\cdot\frac{s^3}{s^3-1}=\frac{35Pa^3}{162}\left(\frac{s^3}{s^3-1}\right)=.765566a^3.$$

Remarks.—In case any of your able mathematical correspondents should state, (as Kinclaven justly did, No. 417, with respect to Σ's solution of two *geometrical problems* from Mr. Newton's *Appendix to Euclid's* Elements), that "The Oxford Student has not advanced farther in the mystic science than a journeyman." I beg to add, that "after finding the sum of all the inscribed spheres, it is well known that the greatest cone that can be inscribed in a sphere, is to the sphere itself as 24:81 ∴ the sum of the inscribed spheres multiplied by $\frac{24}{81}$ will give the content of all the inscribed cones, that is $\frac{Pa^3}{6}\left(\frac{s^3}{s^3-1}\right)\cdot\frac{24}{81}=\frac{4Pa^3}{81}\left(\frac{s^3}{s^3-1}\right)$ the same as before found.

Yours, &c.
AN OXFORD STUDENT.

SUB-MARINE ADVENTURERS.

Sir,—From a paragraph in the newspapers, it appears that Mr. Dean, the diver, is now at Spithead engaged in recovering property from a vessel wrecked there some years ago. Mr. Dean is the same person who descended to the bottom of the River Thames on the 5th of December last, from a barge moored near the centre arch of Southwark Bridge. At high water the diver made his appearance habited in a sort of canvass dress, having a coil of tubing round his body, and a sort of helmet on his head; about his middle were affixed weights to enable him to sink easily. A rope being made fast round his body, he descended a ladder fixed at the head of the barge, and went to the bottom of the river, and remained under water at least 4½ minutes; he then came up the ladder and delivered something he had taken from the bed of the river to the people in the barge. He next again descended, and remained under 9½ minutes; he then came on board the barge and divested himself of the whole of the apparatus in a few minutes.

I believe Mr. Dean's contrivance* is something similar to an apparatus patented a few years ago by a correspondent of the Mechanics' Magazine, Mr. Steele, of Magdalen College, Cambridge.

* As the view I had of the diver and apparatus was merely a superficial one (from the bridge), I should be glad to see a more particular account in the Mech. Mag.

In the month of January, 1828, I was on board the Bell Lighter moored over the Thames Tunnel, when Mr. Gravatt, the engineer, descended. He was under water nearly an hour, and the weather was exceedingly cold, yet I observed that when he came out of the bell he seemed to be in a profuse perspiration; a circumstance which confirms, in some measure, the experimental observations of Mr. Milne, as detailed in Number 471.

At the time of the first irruption of water into the Tunnel, Mr. Faraday descended in the bell with Mr. Brunel, Jun.; and in a Lecture at the Royal Institution, Mr. F. stated a remarkable fact, that Mr. Brunel, when he dived under water from the bell into the Tunnel, was able to remain full *two minutes* under water without experiencing any great inconvenience. He accounted for the fact in this way: when the bell was lowered to the greatest depth (about 15 feet) the air inside was necessarily much compressed; the persons in it, therefore, though they inhaled the same *bulk* of air which they would under other circumstances, yet as two atmospheres were compressed into one, inhaled twice the *quantity*, and of course a much larger supply of oxygen was furnished to the lungs.

I am, Sir, yours, &c.

J. ELLIOTT.

We subjoin an account extracted from the Norwich Mercury, of the exploits of another diving adventurer of the name of Bell, which are in most respects similar to those of Dean, but distinguished by one or two novel circumstances. We do not perceive that similarity which Mr. Elliott supposes to exist between the plan of Mr. Dean and our ingenious friend Mr. Steele; but we may observe that both Mr. Dean and Mr. Bell have done no more than reduce to practice a mode of sub-marine exploration proposed by a correspondent at Leicester, in one of our early volumes, and there very fully explained (see vol. 4, p. 185).—ED. M. M.

MR. BELL'S OPERATIONS.

"There is a small cutter now lying in our (Yarmouth) roadstead, belonging to a man named Bell. Her crew consists of six men, several of whom are singularly expert in diving. She sails about from place to place, to offer assistance to recover lost treasure, &c. She has arrived for the purpose (by permission of the Admiralty) of endeavouring to obtain a portion of the treasure lost in the Guernsey Lily transport, which got on the Cross Sand, floated off, and afterwards foundered in the centre of Yarmouth-roads, in 43 feet water, coming with stores, &c. from Holland, after the Duke of York's expedition in 1799. The transport was laden with horses, ammunition (in which were 25 brass field-pieces), a stock of wine, &c. The method these divers use is curious:—The cutter is first placed immediately over the wreck, the diver then, habited in an India-rubber air-tight dress, having a tube attached at the back of the neck to receive the air (which is constantly kept pumping in) descends from a rope ladder, and gives signals for certain things to be sent down by a small line, which is attended to by those on the deck of the cutter; by this line baskets and other utensils are sent down for the use of the diver, and sent up again with wine, &c., taken from the wreck. The diver's head dress is curious: it is composed of copper, and is a complete covering, much after the manner of the ancient helmet, only that it is made larger than the head, and has in its upper part three glass windows; it weighs 50 lbs. He has two other dresses on besides that above-mentioned. He carries down with him 120 lbs. of lead in two bags. With all this weight he declares that when in the water he appears perfectly free from weight or incumbrance of any sort. There has been already brought up a large quantity of wine (the bottles curiously tattooed with large and small oysters, which have been tasted, and are excellent), some copper, iron handles of chests, pieces of guncarriages, &c. They hope soon to be in possession of the brass guns, valuable plate, and the dollars, which it was known the transport had on board for the purpose of paying the troops employed in the above-mentioned expedition. The Admiralty, we understand, has handsomely given permission to Captain Bell to make what use he pleases of the articles found, only conditioning that the brass guns, if recovered, shall be given up, for which they will return value. Great numbers of persons from different parts of the country have been off to view this novel and singular undertaking. The diver, when under water, finds his strength so increased, that he can bend the ends together of the large iron crow-bar (3½ feet

long and 9½ inches in size) which he takes down with him to part the wreck. These divers go down alternately about twice a-day, but are compelled to take advantage of the tides when it is slack water."

BROWN'S GAS VACUUM-ENGINE.

Sir,—The appearance of the letter of "Matter of Fact," in your 471st Number, after the convincing exposure of Mr. Brown's pretensions furnished by "A Practical Engineer," induces me to request that you will allow me, through your medium, to ask Mr. Brown or "Matter of Fact" the following simple questions:

1st. What is the actual power of the gas vacuum-engine at Croydon? I, at a rough guess, suppose it to be between 4 and 5-horse power.

2d. What is the capacity of the gas-ometer?

3d. How many retorts are employed to make the gas? And do they work night and day? In fact, how long are the retorts when fixed in coke-ovens (where no draught of air takes place) in making enough gas to work three hours (the time necessary for supplying water to the canal for two days).

4th. What power was the steam-engine that effected the above purpose before the gas vacuum-engine was adopted? And how many out of the 48 hours did it work?

5th. How could a steam-engine (of say 5-horse power) working 3 hours only every 2 days, cost, as is stated, £275 per annum?

6th. What approximation has he actually made towards a vacuum in inches of mercury? I am told that he puts a valve at the bottom of the guage of mercury, so that when it is thrown up by the impetus of the explosion, it cannot descend, but deceptively shows a column permanently as high as it is raised by the impetus. Is this true? And is the same the case with the water-guage?*

7th. What work does the indicator (as applied to steam-engines) show that the gas-vacuum performs? If he have not applied the indicator, is he willing to allow it to be applied for the satisfaction of the public? I suspect that the average vacuum in the cylinder is very trifling.

8th. When does he intend to put the public in possession of his grand discovery of making gas from water in sufficient quantity, and at so small an expense, as to answer for propelling vessels, &c.

9th. By what magic is it that millstones turned by steam-engines do not make such good flour as when turned by a water-wheel, supplied with water by the gas-vacuum engine?

Mr. Brown's replies to these questions will, I am sure, oblige your readers in general, as well as

Your old and faithful servant,

HONESTUS.

* We feel bound to say, that, on our visit to Eagle Lodge, we saw nothing whatever to justify the injurious insinuation conveyed by these questions. *To suppose*, indeed, that Mr. Brown could *have recourse, for any temporary purpose, to a trick so certain of ultimate*, if not speedy detection, *appears to us altogether* preposterous,—ED. M. M.

NOTES WORTH NOTICE.

"Miscellaneous collections are literary Bazaars, where every one, however hard to please, is sure to find at least *one* article suited to his use or entertainment."

The Gresham Lectures.—By the last Number of the venerable "Gentleman's Magazine" it appears that a sort of hole-and-corner fête, under the style and title of a "Gresham Commemoration," was got up in the City on the 12th of July. Sir Thomas lies buried in the ancient priory church of St. Helen's, Bishopsgate; the ceremony, therefore, commenced by the performance of divine service in that building, various occasional anthems being introduced, and the responses chanted by "the gentlemen of the choir of St. Paul's and the Chapel-Royal," assisted by several professional singers. A Jubilate, which gained the Gresham Prize Medal of 1832, was also performed, and an appropriate discourse delivered, after which some of the company accompanied the singers to Crosby Hall, where some glees were sung from the very spot which, four centuries ago, used to be the music-gallery! It is gratifying to see that Gresham is still remembered in the City; but better justice would certainly have been done to his memory, if the money laid out on these inconsequential proceedings (for there was a subscription entered into on the occasion) had been expended in an endeavour to restore the Gresham Lectures to something like their pristine efficiency. We are in hopes a public meeting will, ere long, be called on the subject.

The Penny Press in France.—The rage for penny publications is most unprecedented, but it can hardly last, although "Penny Cyclopædias" are confidently

announced which would take some twenty years in completing! The mania has even extended to France, where a *Liberal* Association, in humble imitation of our "Society for the Diffusion of Useful Knowledge," have commenced the publication of a weekly penny periodical, under the title of "Good Sense" (*Le Bon Sens*). The day chosen for its appearance is Sunday; and the chief supporters and contributors are Lafitte the ex-Premier, Odillon-Barrot, the leader of the Movement party, and Arago, one of the most eminent living men of science in France, who accompanied Captain Freycinet in his voyage round the world.

Commemoration of the Invention of Printing.—The inhabitants of Mentz have determined to erect a monument to Guttemberg, the great inventor of the art of printing; and to effect their object on a proper scale, they call upon the learned of all nations for subscriptions towards the object. It is very appropriately intended to complete the erection in the year 1836, as then it will be exactly four centuries since Guttemberg perfected the invention by the discovery of moveable types. The names of all donors are to be preserved in a book kept by the corporation of Mentz. We are afraid, however, that most of "the learned" will feel inclined to leave the art to its best commemoration—its own enlightening effects. Besides, if this scheme were to succeed, we should next be called upon, doubtless, to contribute to the architectural adornment of the good town of Haerlem, for its claims to the honour of being the birth-place of "the Press" are by no means settled, whatever the inhabitants of Mentz may think.

Foreign Scientific Union.—The next grand meeting of the Men of Science on the Continent, from which was derived the idea of establishing "The British Association for the Advancement of Science," is to commence on the 18th of September, and conclude on the 26th. The place of meeting for this year is Vienna. This is the tenth anniversary.

North London Literary and Scientific Institution.—This new Institution, although only established within the last few months, appears to be in a flourishing condition. Several courses of lectures are already in progress of delivery—amongst others, a course on mechanics by Mr. Kingsnorth, at the house of the Institution, heretofore the Clerkenwell Charity School, in Aylesbury-street. As might have been anticipated, the rate of the subscription, originally fixed at the *very low and inadequate* sum of twelve shillings per annum, has been necessarily raised to a guinea. We wish every success to the North London Institution, but cannot help observing that it is almost exclusively adapted to the accommodation of the inhabitants of Clerkenwell only, so that its title is somewhat too comprehensive. In fact, the northern environs of London ought to be capable of supporting half-a-dozen literary Institutions, which probably need only to be set on foot with spirit, to meet with permanent success.

London and Birmingham Railway.—Notwithstanding the rejection of their Bill by the House of Lords, it is understood that the Company intend to persevere. and to apply again for an Act next Session. It is seldom that improvements of this magnitude are carried into effect without great opposition; and seldom that that opposition has not dwindled away after a time. The Company must be cravens, indeed, if they leave the field to the enemy after the present rebuff, with the example of their brethren of "the Liverpool and Manchester" before their eyes; *their* Bill was thrown out quite as decidedly on its first appearance.

Death of Chaptal.—French science has sustained another serious loss by the decease of Count Chaptal, the celebrated chemist. The Count was also a political character, and served many high offices under Napoleon, and even, we believe, since the Bourbons were restored. His works, chiefly on chemistry, are very voluminous. He was also proprietor of some extensive manufacturing establishments, although, like many eminent theorists, he was by no means very successful in conducting them.

Beet-Root Paper.—It is well known that paper may be manufactured from a great variety of articles besides those generally in use for the purpose. At one time it appeared probable that the making of paper from straw would become a considerable branch of industry—and among the numerous advantages of Cobbett's Indian corn was enumerated the capability of its husks for being manufactured into paper; the experiment was actually tried, and the title-page of Cobbett's book on the subject was printed on paper the result of that experiment. He was outdone, however, by a Swedish gentleman named Sinisen, who recommended beet-root for the purpose, and crowned a long series of experiments by publishing an account of them in a book *composed entirely of beet-root paper* of a superior quality.

R. H.

Extinct Monsters.—Among the many interesting facts which the researches of modern geologists have brought to light, there is none more extraordinary and imposing, than the discovery that there was a period, when reptiles of appalling magnitude were the lords of the creation before the existence of the human race, and existed in latitudes now too cold for the habitation of modern oviparous quadrupeds. In England remains have been discovered of the Megalosaurus (Great Lizard), which must have been nearly 40 feet in length, and 7 or 8 in height; of the Iguanodon also, which, there is good reason to believe, attained a height of 9 or 10 feet, and was from 60 to 100 feet in length!

Quarantine Absurdity—Cargoes of cotton from the Mediterranean have been detained at Milford Haven for three months, to the great loss of their owners, on account of their having come from places where the plague prevailed; and, after all, they have been unshipped as they arrived, for with us the cotton is not unpacked as it is at the lazarettoes on the Continent—*Dr. Henry*—whose simple and effectual plan of disinfection ought to put an end to all such vexatious regulations.

Nothing like keeping Accounts.—The practice of the travellers (for Mr. Mitchell, an eminent potter, 1740), was not to take out invoices, or, in returning, to render an account of the sales, but merely to empty their pockets; after which they received their wages (5*s.* or 6*s.* a-week), for the time of their journey; their expenses having been paid out of the cash received. *Thus each traveller saved sufficient* to avail himself of any favourable opportunity to commence business for himself as a dealer in glass and earthenware; and each has been successful, while it is painful to add, some of Mr. M.'s descendants *are now in low circumstances in Burslem.—Shaw's History of the Staffordshire Potteries.*

Earthenware Furniture.—Mr. T. Mayer (of the Cliff Bank manufactory) has succeeded in a *chef d'œuvre* of the art of pottery, by many considered as the best specimen of solid earthenware hitherto produced. It is an earthenware table of truly elegant workmanship, 32 inches in diameter, on an elegant pedestal of proportional dimensions; ornamented in a very chaste style with subjects from natural history.—*Ibid.*

Hints to Gardeners.—1. Every person who has been in the custom of visiting hot-houses, greenhouses, &c., must have often noticed the distress which many valuable plants seem to labour under, owing to the scorching heat of the sun's rays. Mats are commonly drawn over the glass, but while they serve to shade the plant, they intercept the heat, and thus only substitute one evil for another. Now, if the inside of the glass were darkened by means of the flame of a candle, which is soon done, the plants would have all the heat they can receive without any scorching. 2. If fine wadding is laid on peaches and apricots, and other fruits about to ripen, it will keep off the flies, wasps, &c., which appear to mistake it for their great enemy, the cobweb. 3. When flies attack fruit, it is best not to gather it, but to let them feed upon it; in that case they rarely meddle with any other.—*W. Pilcher, Lynn, Aug.* 25.

A perfect Solvent of Caoutchouc.—Take equal weights of sulphuric acid and water, mix them, and when cold add a quantity of it to a quantity of oil of turpentine, and agitate thoroughly; the acid will become coloured by uniting with or charring the resin; let the acid subside, and decant the clear spirits. Repeat the operation until the acid subsides without being discoloured. The oil of turpentine thus prepared, with warmth and strong solar light, is a perfect solvent of caoutchouc—*S. Guthrie—Silliman's Journal.*

Expulsion of Air from Pipes.—A correspondent of the American Journal of Science makes mention of a singular phenomenon attending the expulsion of air from a train of water-pipes in New York. The pipes are ten inches in diameter; the train about one mile long, and at the end there is a stop-cock, with an orifice in the side, to which was attached a piece of hose with pipe, the orifice of which was about half-an-inch in diameter. "When the water was let into the pipes, the air began to rush out at the small orifice in the pipe attached to the hose, with a noise resembling the letting off of steam from a boiler; after a few moments, a blue flame was to be seen issuing from the tube, which continued for fifteen minutes, about three inches in diameter and two feet in length. After the air had all passed out, the water followed with a force sufficient to elevate it to a height of about fifty feet."

Valuable Hint to Colour Mixers.—The power of the sun's rays in augmenting the intensity of the hues in many things, is well known. There is an admirable colour for foliage to be obtained from the union of light Prussian blue, with dark gamboges; but I could never acquire this clear and lustrous colour without compounding it in the light of the sun. As the young artist will find this a most useful pigment, I may, in addition, say, that a small bit of the light Prussian blue, with three or four times the quantity of gamboge, must be laid on the pellet or saucer, and with a few drops of water, only enough to make it work easily, be most thoroughly united and incorporated by the finger, *with the sun shining upon the mixture*, adding more gamboge repeatedly during the operation, until the blue is subdued and a clear green produced. It is a tedious operation, yet perseverance will ultimately produce a very brilliant permanent green.—*Journal of a Naturalist.*

INTERIM NOTICES.

We have received Mr. Hiort's letter, and regret that we should have been led, by a sense of duty, to speak in less than terms of praise of the speculations of a gentleman who can write so well and scold so handsomely; the more especially that we gather from what he says, that it is a stranger to the British isles who so generously offers them (before all other countries in the world) the possession of a secret which will add 20 per cent. to the produce of their corn-fields: The error of which he makes such a handle, respecting the conversion of this "twenty per cent." into "twenty for one," he will find explained among the "Errata" below; which "Errata," we beg to observe, were sent to the Printers before the receipt of his present letter, and are shown, by the mention made of the "twenty plus improver" in a subsequent part of the article complained of, to be no after-thought.

Communications received from Mr. Booth—Wersac Daldawl—J. W. H.—Mr. Harrison—A Novice—Mr. Pilcher—Mr. Forster—E. C. H.

ERRATA.

In a few copies of No. 471, page 322, col. 1, l. 15 from the bottom, for "gg feet by gg," read "40 inches by 27."

Page 343, for "twenty for one, instead of two for one," read "twenty per cent., plus the two for one."

Page 351, col. 1, line 10 from the bottom, for "fourth," read "first."

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MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 474.] SATURDAY, SEPTEMBER 8, 1832. [Price 3*d*.

CANNING'S LIFE-RAFT.

Fig. 1.

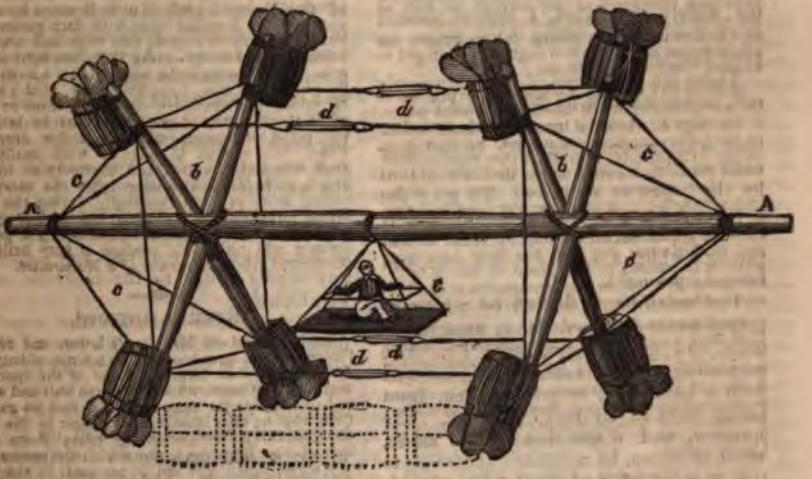
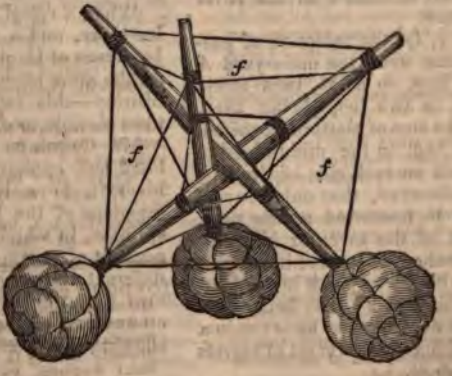


Fig. 2.



CANNING'S LIFE-RAFT.

Sir,—It is probable that during the last summer many of your readers may have seen on the River Thames, in the vicinity of New London and Blackfriars Bridges, a singular-looking machine, composed of spars and floated by barrels, the object of which was not very apparent.

The machine is, however, one of considerable importance to the maritime world, being a life-raft, invented by Mr. Alfred Canning, R. N., for the relief of persons in danger of shipwreck; and as a knowledge of its construction cannot be too widely circulated, I beg to submit the following description for insertion in your Magazine.

There are two forms of Mr. Canning's raft, as represented by figs. 1 and 2.

In fig. 1, A is a main-yard or other spar, with two cross-spars, *b b*, lashed near each end of it, and kept in their places by the ropes or stays *c c*. To give the necessary firmness to the machine, four of the ropes terminate in a loop at *d d*, through which a smaller cord is rove, and braced up *taught*.

The machine is floated by means of empty water-casks, one being attached to each end of the cross-spars *b b*. The projecting end of each cask is covered with a hammock, to protect them from being stove in by rocks, &c. &c. The number, and disposition of the casks, must, of course, be regulated according to the number of persons to be carried. When the number is great, it is advisable to place the barrels as shown by the dotted lines, to obtain sufficient buoyancy. The raft exhibited on the River was so supported.

A platform *e*, for the reception of passengers, is slung upon the main-yard A by a strong loop, so as to turn freely upon it; one or two loops being used, according to the size of platform required. The loops are kept in the middle of the yard by a chock on each side of them.

It will be observed, that only four of the casks can be immersed at one time, and the object of the inventor in using twice that number, is to permit the raft to roll over, without any risk to the parties on the platform *e*; that being suspended as just described, so as to retain a horizontal position whichever set of barrels may be undermost.

Fig. 2 shows another modification of this raft. It is composed of three spars, lashed together crosswise at the middle, and braced up by means of the ropes *f f*. To each end of these spars* is attached an empty cask, or a cork-fender, to give the requisite buoyancy. If casks are used, they should be protected with hammocks, as before described. The persons upon this raft support themselves in the centre, holding on by the ropes, and shifting themselves whenever the raft rolls over.

It is right to state, that the merits of this raft do not rest upon fresh-water experiments; Mr. Canning having made numerous trials with it on various parts of the French and English coasts, with invariable success, particularly at Cherbourg and Jersey. At the former place, a raft of the description shown at fig. 1, was drawn out to the head of the jetty in very stormy weather; Mr. Canning having seated himself on the platform, the raft was turned adrift, and was driven by the wind across the mouth of the harbour upon the rocks, and was eventually thrown by the waves, high and dry, upon a shore of the most dangerous character, without any injury either to the machine or to Mr. Canning.

This machine possesses the requisite firmness and stability, with just so much elasticity as is necessary for its safety. It carries the persons on it higher, and consequently drier, than any other raft; and is perfectly safe and certain on shores, where a life-boat would inevitably be dashed to pieces. The materials of which it is composed are such as may be found on board almost every ship, and the raft may be put together in a comparatively short period of time.

When a vessel has been wrecked on a lee-shore, and a communication formed by means of Captain Manby's apparatus, or the more recent improvements of Mr. Murray—this raft would be found a most eligible mode of landing the crew.

Mr. Canning, some time since, exhibited and explained the construction of his raft, in a lecture delivered to the members of the London Mechanics' Institution, in which he gave an interesting account of several of his experiments in different places; and expressed his readiness to put to sea in the severest storm, on any part of the British coast; thereby showing his perfect confidence in the

* For the sake of clearness, one only is shown in the drawing.

safety and efficiency of his simple life-raft.

The Society of Arts have presented Mr. Canning with their large silver medal, as a token of the high opinion they entertain of the ingenuity and utility of his contrivance; and *I guess* it will be some time before they have an opportunity of rewarding another of equal merit.

I remain, Sir, yours respectfully,

W. BADDELEY.

London, August 30, 1832.

NEW AFRICAN EXPEDITION.

The most interesting armament ever dispatched from the shores of Britain has just been equipped at the expense of a few princely merchants of Liverpool. Its objects are to explore and open a commercial intercourse with the heart of Africa by means of the mighty waters of the Niger.

The public are aware that Richard Lander, an obscure and uneducated, but enterprizing and intelligent Cornish servant of Captain Clapperton, recently ascertained that the Niger below Boussa, after wandering for four or five hundred miles through the heart of Western Africa, and receiving the contributions of many navigable streams, empties itself into the ocean by several embouchures in that immense bay of the Atlantic called the Gulf of Guinea. The Nun River, by which Lander and his brother descended to the sea, disembogues its waters near Cape Formosa, a promontory separating the Bight of Biafra from the Bight of Benin. From our settlement at Fernando Po to the Nun River does not exceed 150 miles, so that the importance of our obtaining a footing upon that island is manifest; for, in all probability, the Nun is the principal embouchure of the Niger, though this point is not yet decided. Thus much, however, appears certain, that, entering up this channel, the Niger is navigable for the whole 4 or 500 miles between Boussa and the sea; that though above Boussa the channel is obstructed by a barrier of rocks, yet little doubt exists of its having a communication with Timbuctoo; and, which is of greater consequence in a commercial point of view, that throughout its whole majestic course, the Niger rolls through a fruitful, cultivated, and thickly populated country, studded with towns and villages, hitherto unvisited by Europeans; and having no other trade with civilized nations than such imperfect barter as could be carried on across burning desarts, by the agency of slave-dealers, and periodical caravans. What a field is here displayed for mercantile adventure! What an opening for extending the trade of Great Britain! What a market for our languishing manufactures! What a means of striking at the heart of the slave trade by introducing civilization and industry across the very route of the principal Caffilas! What a harvest for geographical and other science, in exploring the Niger and its tributary streams! What an opportunity for our Missionaries to spread the light of the Gospel in the focus of idolatry and superstition! What a glorious chance of converting myriads of heathen nations; and of substituting for ignorance, cruelty, and barbarism, the blessed doctrines of peace, good will, and eternal salvation!

It is with prospects like these, and with a view to secure the advantages in question for our own country, that proposals were made to his Majesty's Government to take immediate possession of Lander's newly-discovered river. Why this project was not eagerly adopted it is difficult to determine. Finding no disposition on the part of Government to assist in appropriating the commerce of Africa, Mr. Laird, and some other merchants of Liverpool, determined to fit out an expedition at their own expense; and so little encouragement did they receive, that the Treasury actually refused to permit the vessels on their return to land their cargoes duty free. Yet no sooner had Mr. Laird, jun., accomplished the equipment of his squadron, than the Admiralty requested permission to send out a surveyor of their own to take observations, determine latitudes, longitudes, &c. Fortunately for the nation at large, Mr. Laird did not object to this appointment, and Lieutenant Allen, R. N., was selected by the Admiralty hydrographer; an officer whose conciliatory, amiable, and gentlemanly manners, soon secured him the personal regard of Mr. Laird, and of every person on board. Every thing being at length prepared, and Mr. Lander having promised to accompany the expedition, the vessels composing it assembled at Milford Haven as follows:—

Quorra steam-vessel. Having on board Mr. Laird, jun., of Liverpool, as director and supercargo of the squadron.

Sailing-commander, Mr. Harries, Master of the Royal Navy, an officer well acquainted with the coast of Africa.

Lieutenant Allen, surveyor, furnished with numerous instruments, for observing the dip, latitudes, longitudes, &c.

Richard Lander, African traveller and discoverer of the termination of the Niger, acting as guide, adviser, and partly as interpreter to the expedition.

Also a gentleman of ability, who has

volunteered to accompany the squadron as surgeon and naturalist.

The *Quorra* is 115 feet in length over all; breadth of beam, 16 feet; depth of hold, 8 feet; draught of water, with every thing on board for ascending the Niger, 4 feet 2 inches; tonnage 146, including the engine-room. One engine of 40 horse power, to be used only in calms and in ascending rivers. Constructed to burn either coal or wood, as may be required.

Alburkah. So named from an African expression, signifying *blessing*. A small steam-vessel, built entirely of iron, by Mr. Macgregor Laird, director of the expedition. Fitted with one steam-engine of 15-horse power, constructed to burn wood or coal. Vessel 70 feet in length over all; breadth of beam, 13 feet 2 inches; depth of hold, 6½ feet; draught of water when launched only 9 inches! With engine in, and boiler full, drew 2 feet 6 inches; drew 4 feet 6 inches on leaving Milford Haven, having provisions and water for 12 men for 50 days, besides 10 tons of coal. Bottom of the vessel ¼ inch thick; sides, $\frac{3}{16}$ inch thick. Gross weight when built, and wooden decks laid, 16 tons, tonnage 56, including engine-room. Schooner-rigged, like the *Quorra*. Commanded by Mr. Joseph Hill.

N. B. The greatest interest has been excited about this diminutive vessel, as it is certainly a bold undertaking to navigate the Atlantic in so small a boat, built entirely of *iron!* She is intended to explore the Tschadda, and other tributary streams of the Niger.

Columbine. Merchant-brig of 176 tons. Commanded by Mr. Miller. This vessel conveys a considerable quantity of coal, and a very curious investment of goods for trading with the natives. Her bill of lading would, indeed, have furnished a most ludicrous assortment of articles, from a penny whistle to a kingly crown!

Armament.

Quorra . .	24-pounder	swivel-gun,	1
	18 do.	do.	1
	4 do.		8
Alburkah .	9 do.	swivel-gun,	1
	Swivels		6
Columbine .	6-pounder carronades,		4
	Total		21 guns

Besides musquetoons, firelocks, boarding-pikes, cutlasses, pistols, &c.

The expedition was detained at Milford several days, waiting the arrival of Mr. Lander, but as the wind blew steadily at north on the 24th of July, Mr. Laird dispatched the *Columbine* and *Alburkah* for *Port Prayah, in the* Cape de Verds, that being the first place of rendezvous. A day or two after, Mr. Lander arrived in a fishing-boat from Ilfracombe, and in an hour the *Quorra* put to sea, bearing with her the hearty good wishes of every spectator.

It is Mr. Laird's intention to proceed, in the first instance, to Port Prayah, where he hopes to meet with the commander-in-chief of the African station, who has orders to render him assistance. From thence they go to Cape Coast, to take on board some Kroomen negroes to cut wood in going up the Niger, and dash on at once to Boussa, opening communications for a trade in gold-dust, palm-oil, and ivory, by the way. The *Alburkah* will explore meanwhile all the principal tributaries of the Niger, and it is not altogether beyond possibility but she may find a way through the Tschadda, Shary, or some other river, into Lake Tschad, in the centre of the African continent; nay, some flatter themselves with the dream of being able to penetrate into Abyssinia and the Red Sea by rivers running out of Lake Tschad in an easterly direction. What would be the astonishment of the good people of Bombay should this cockle-shell of a vessel—not larger than the boiler of Whitbread's brewery—and built of iron, force her way through the centre of Africa, and so on by the Red Sea and Straits of Babel Mandel, to Socotra, and the coast of Malabar! Let this vision terminate as it may, the attempt deserves success; and that the whole of the spirited individuals by whom it has been undertaken will be rewarded by the fullest realization of their most sanguine hopes, is the sincere prayer of one who with difficulty restrained the desire to quit wife, family, and friends, to embark with the wanderers composing the African expedition! — *United Service Journal for September.*

ART OF BELL CASTING.

"Can you who understand all books,
By judging only with your looks,
Resolve all problems with your face,
As others do with B's and A's;
Unriddle all that mankind knows,
With solid bending of your brows;
All arts and sciences advance
By screwing of your countenance;
And with a penetrating eye,
Into th' abstrusest learning pry;
Know more of any trade b' a hint,
Than those that have been bred up in't:
And yet have no art, true or false,
To help your own bad naturals."

Sir,—At first I did not intend to notice the thoughtless effusion of your Clerkenwell correspondent, V. W., in your 458th Number, respecting bells; and it is on

an occasion of turning to it again, that I have chosen to reply.

That V. W. should have gathered hints from Mr. Drury, is no way surprising; but that he should entertain such a strong conceit, that the knowledge he has acquired respecting bells, by those hints, is superior to what I have acquired by long study and close application, cannot but appear very extraordinary. Indeed, none but a simpleton would expect me to divulge my discoveries in order to afford matter for discussion; and who but a simpleton could have conceived the idea of my supposing Mr. Drury's bells to be without crowns? A sonorous vibration cannot possibly proceed from any bell without a crown, whatever its form may be.

If, instead of this *very comprehensible* gentleman judging of my book *only with his looks*, he will take the trouble to read it over again attentively, he will plainly perceive, that it is himself, and not me, that *has fallen into a blunder*.

I have shown in my "Introduction," that any straight part in a bell does not sensibly aid its vibrations; that it is the inflected parts that are chiefly disturbed by the vibrating motion; these yield to the motion by bending and unbending, and thence become exerted, and impel the vibrations by their endeavours at restitution, in all parts inversely, as the respective radiis of curvature. And this strictly applies so long as the inflection does not exceed the proper degree, and the thickness is not great to an extreme. Now, Mr. Drury's bell-crowns are flat throughout, without the least bend in any part (if we are to judge from the plates published in your Magazine); they, consequently, are void of that impelling property which is inseparable from inflection, and by which the vibrations of bells are sustained.

But, because Mr. D.'s bells have crowns, V. W. asks, "What becomes then of Mr. H.'s assumption, that they have only one impelling cause? or, of the argument he founds on that assumption that they will not answer?" Assumption, indeed! I conceive the matter to be demonstrably shown, and daily experience confirms it. I find the activity of the parts of bells to be directly as their inflection; and I beg to inform Mr. V. W. that I have nowhere said, Mr. Drury's bells *will not* answer. The paragraph will, however, best speak for itself—it runs thus:

"There is another class of bells, which has lately been discovered by a Mr. Drury, the vibrations of which depend on the most simple principles. These bells are destitute of curvature, their sides being quite straight, and the shape very similar to a round tub. Of course the vibrations of these bells are only supported by "one impelling cause," that of the circular form; and this being a perfect principle, as I have before observed, it should seem that little investigation would suffice to determine the concurring thicknesses, which, as regards the make of the bells, is all that is required to produce harmonious sounds. Nevertheless, the consequence of *having only one impelling cause to urge the vibrating motion*, (there being no curvature to assist the circular form), is, that considerably more thickness is required to enforce the same rate of vibration. Hence, bells of this form must needs be much deeper toned than clock bells, with an equal thickness of metal; and it follows that this form is only adapted to small bells, the diminutive size of which renders their tones liable to be too acute."

Now, the purpose to which Mr. D.'s bells most fitly apply, is that of small musical bells; to this purpose they certainly are well adapted, being the least susceptible of deviation in execution, and their particular dimensions comparatively easy to determine. For, having no curve, their tones cannot be impaired by any irregularity in that on which they have no dependance, and are destitute of; nor are any lines formed with greater facility than straight ones, nor any figure more easily formed true than a round one; which being the only active principle on which the vibrations depend, and the degree of activity in every part depending on the thickness thereof, it is evident that, besides the proportion of the height to the width, there is only the simple thickness of each part to assign, and this intirely free from all entanglement either with regard to curvature or angular position, &c. &c.

But, seeing that in defect of curvature, they require considerably more thickness than clock bells,* to produce the same

* The form of clock bells seems to be equally well adapted for supporting a vibratory motion as that of church bells: the former has most curvature, while the latter has the support which its inflected crown affords, to supply its lack of curvature.

tones, it is quite plain that this form cannot be adopted in a bell of large size without a very serious additional weight of metal; and, what is still worse, the greater the thickness of metal required, the less will be the quantity of sound produced; because the tremulous or vibrating motion (from whence the sound proceeds) is confined to narrower limits, on the same principle that a thick plank cannot bend to so great a distance as a thin board.

But, great as the disadvantage may already appear, I have as yet only represented one half of the loss; for the flow of sound does not merely diminish with the distance to which the vibrations range, but with the *square of that distance*; whence it follows, that if the thickness should be so increased as to limit the range of the vibrations to only half the distance in obtaining any given tone, then only one-fourth part of the sound would be produced; the motion of vibration being subject to the same law as any other motion in a resisting medium.

Thus the importance of forming a bell so as to vibrate at any rate that may be required to produce any given tone with the least thickness of metal, is evidently very considerable. And it is equally manifest, that this is not to be accomplished by flat crowns and straight sides, which can yield no sensible aid to the vibrations, unless the crown and upper parts are thick to an extreme; and which are, therefore, solely impelled by the circular form in conjunction with greater things. On the contrary, this *desideratum* is both theoretically and practically effected by forming the crowns and the curvature of the sides, so as to create a degree of exertion much greater than that of the circular form, and thence afford all possible aid to the vibrations; by which (instead of the single support which the circular form affords), three acting principles or impelling causes are obtained, all conjointly contributing to the vibrating motion; whereby, not only much less thickness is required, and the advantages consequent thereon attained; but the lower parts (from which the greatest part of the sound proceeds), are caused by the obliquity of the position, to vibrate in an oblique direction, viz., in the hypothenuse of a triangle, nearly equal in length to twice the radius of the bell itself,—whence another weighty advantage accrues.

Nevertheless, the complicated action of three distinct principles renders the concurring dimensions of all parts (embracing both form and thickness) exceedingly more perplexed than is the case with the simple principle by which the vibrations of Mr. Drury's bells are impelled; so that it seems somewhat strange (if what V. W. says be true) that he should have followed up his experiments "with quite as great pertinacity" as myself, and yet have been more than thirty years in tracing out these so much more simple proportions!

V. W. says, that both Mr. D. and myself have each discovered the advantage of reducing the height of bells; but that Mr. D. goes to the greatest extent. But how does he make this out? He ought to have given an explication hereof, because the mere assertion of a person who treats his subject in the vague manner V. W. does, is of little value, and, I believe, I shall have no difficulty in making the direct contrary appear.

Mr. Drury's bells have no resemblance whatever to church bells; they not only class next to clock bells, but they may be considered to be derived from them; the regular curved form, containing near 90 degrees of curvature, from the centre to the edge, being rejected, and in place of curvature, the crowns and sides being made quite straight, forming an angle of near 90 degrees at their junction. But so far from finding an advantage in reducing the height, he (Mr. D.) has increased it considerably; and I am well satisfied he has found no small advantage in such increase, it being requisite in bells of such form. So much for this incoherent twaddle.

Though the whole of V. W.'s paper smacks greatly of a pert and thoughtless confidence, yet in no part is this more conspicuous than in his shallow trade respecting my "fanciful curves." Here he plainly shows that he does really imagine himself to

> "Know more of any trade b' a hint,
> Than those that have been bred up in't."

And, notwithstanding his bombast about what "Mr. D. has proved beyond the possibility of doubt;" I have demon-

whence the apparent difference in the advantage of each form, seems so trivial as to make it signify *ther Mr. Drury's bells are compared with* *r church bells.*

strated theoretically, and proved a hundred times over practically, that, however well, curvature may be dispensed with in small bells, it is of the greatest importance, and by no means to be dispensed with in church bells.

I shall reserve my remarks on what he tells us about "eight octaves" to another opportunity, and only here observe that the acute bell is to perform no less than 256 entire vibrations in the identical space of time that the grave bell requires to perform a single vibration.

I am, Mr. Editor,
Yours, obediently,
JAMES HARRISON.

Barton-upon-Humber,
Aug. 24, 1832.

P.S.—In acknowledging Mr. Editor's candid observations (page 108) on the subject of my publication, I must inform him that he is quite mistaken in my intention and expectations, having never dreamt of any deputation waiting upon me. Neither have I fondly anticipated that any direct remuneration would accrue from it. It is sufficient that it answers every purpose I expected from it; and at the same time that I present him with my thanks for the advice he gives respecting printing, I beg to say, that it is not by any means my intention to follow it.

J. H.

COMMERCIAL SCIENCE.

Weights and Measures.

Sir,—Mr. Fisher (No. 463) has asked me a question, which I would have answered immediately had I been in London.

As I have been informed, the only decisive proof of spirit of wine, or alcohol, is by weighing it against an equal measure of water. The more condensed is the water, the more highly rectified must the spirit of wine be. At 5 to 4, or 100 to 80, the English Imperial wine-gallon of 8 pints, should contain 8 pounds of spirit of wine. The error in the Imperial (as it is termed) measure of capacity, alluded to in this journal by Messrs. Trebor Valentine and Utting, (No. 419, 422) has caused a loss to the revenue, in the measurement of malt only, to the annual amount of £100,000! I make this statement upon the authority of the *Times* of the 25th of August, 1829. Were the measure of *capacity* derived, as it ought to be, from the lineal standard, there would be a higher maximum for the liquid derived from the malt. I am not able, I regret, to answer the additional question proposed by Mr. Fisher.

With reference to the "Tub for Measuring and Weighing Corn," of which an account is given in this day's Number, from the Gardener's Magazine, I beg leave to add, that wheat and alcohol are to water in the exact relative average of 80 to 100. Mr. Taylor says, that in Norfolk wheat is sold by measure with reference to weight. Mr. Thorn allows two cubic feet of water a-day to each individual. Then 2,000 ounces = 25 pounds of pure water, or 100 pounds of either alcohol or wheat of the best quality. This is 500 pounds to the quarter of wheat. As to the weight or quality of Norfolk wheat, Mr. Taylor cannot give us any information. From the Imperial bushel of 80 pounds of water deduct one-fifth, and we have 64 pounds of wheat, or 512 pounds to the quarter. Now, are the duties levied on 500 pounds, or 512 pounds, or 400 pounds of foreign wheat? Are we to calculate the quarter of foreign wheat at 500, 512, or 400 pounds? Leaving this part of the question, I am glad Mr. Thorn has adopted the South American measure of capacity, which is the water-carrier's load, and which contains of alcohol 100 pounds, (or 200 marks of 8 ounces) of Spain, Portugal, and England, and the United States. Whenever England shall declare, *with the remainder of the world*, that gold and silver are as bread and meat, and iron and coal, but mere merchandise, the *machinery* will not be wanting.

I am, Sir,
Your very obedient servant,
T.

August 11.

P. S. Your correspondent "Oberon" is aware, that the several notices of motions for additional Irish Representatives were, without one word of debate, *withdrawn*. Sir George Murray, and Mr. Staunton of Dublin, have turned up new ground. The duties upon tea, &c. consumed in Ireland and Scotland are included in the English revenue.—T.

SPIDER SPINNING.

Mr. Editor,—Should the following remarks on the spinning of spiders come

within the limits of your Magazine, I shall feel happy in being able, through your means, to give my little mite towards the dispersion of error, though on never so trivial a subject. Since, however, they may perhaps appear to you too foreign to your purpose, let me remind you that the spider is himself a mechanic, and on that score claims of you the privilege of an old acquaintance.

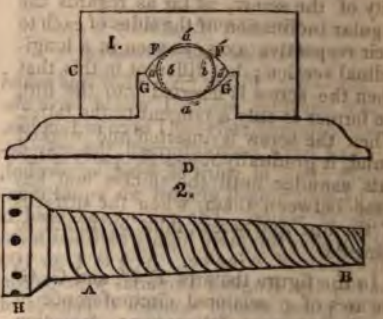
It is a commonly-received opinion that the gossamer-spider is the only one of that laborious race which has the power of shooting a line, or, in other words, of ejecting a thread into the air, of which it afterwards makes use, as a means of moving from one place to another. I have, however, lately satisfied myself that all spiders possess this power, though the gossamer in the greatest, and the rest probably in different degrees. And since the experiment by which this may be proved is at once easy and entertaining, I trust that it will gratify such of your readers as are able to see a spider without horror, and examine it without disgust. Having placed in the middle of a large dish, filled with water, a stone of such a size that the upper part remained dry, I procured a gossamer-spider (aranea obtectrix), a garden-spider (aranea holoserica), a house-spider (arane adomestica), and two others, all of which I put together on the surface of the stone. I must add, that the dish was placed on a table in the parlour, where there was an almost imperceptible current of air. The spiders at first appeared to be rather disturbed at their awkward situation, and climbed over the stone several times. But scarce had a minute elapsed when I observed the gossamer very deliberately walk along a thread attached by some means which I could not perceive, to the edge of the dish, and thus make his escape. Having missed this opportunity of examining the operation, I determined to watch the other spiders more narrowly, for I had read in a book, entitled "Insect Architecture," that they possessed the faculty which the gossamer had just exhibited, if they chose to exert it. But, alas! they were obstinate, and continued for more than an hour to wander over their little island without any such attempts to escape from it. I was almost in despair, when it occurred to me that *the current of air, though* strong enough *to assist the gossamer* in its operation, was not sufficient for the larger spiders. Accordingly, I removed the dish to the open window, and presently had the pleasure of seeing my surmises realized. For they no sooner felt the breeze, than they successively left the stone in the order which I before described, and by the same means apparently, though with greater difficulty than the goosamer. The operation is so admirably explained in the book to which I have referred above, that did I wish to lay it before you, I could do no better than transcribe the words of the author.

My chief object has been to confirm the opinion which he has here advanced, namely, that the faculty of shooting a line though more voluntarily, and more frequently, exerted by the gossamer spider, is not peculiar to that insect. If, however, any are still inclined to be sceptical on this point, I can only allege, in the sense of the old proverb, that it is not fair for persons to condemn another, before they have tried his experiment themselves.

I am, Sir,
Your obliged and faithful servant,
WERSAC DALDAWL.

Devizes, Aug. 24, 1832.

NEW MODIFICATION OF THE POWER OF THE SCREW.



Mr. Editor,—The printer has made an erroneous substitution of "*c* 200 and *d* 200" for "*c* 201 and *d* 200," in the article describing my proposed improvement of Hunter's screw-press, which has, I fear, rendered that article somewhat unintelligible. Before I proceed to notice the figures above, I beg to remind those who may take the trouble to read

the article alluded to, that, as I stated, the construction given is not the best of several; I have one in reserve, which meets two capital objections, which I anticipated as likely to be urged against the practical utility of the improvement —one, the great apparent increase of friction, the other the danger of the square production of the screw twisting under a very severe strain. I beg to add further, that I estimate the power of the press, according to the data given, at upwards of 20,000 tons.

The prefixed figures represent what, I believe, is quite a new modification of the power of the screw; and one which will produce a greater amount of power, at less expense of friction, and with less complexity of construction, than any other. As the common screw is familiarly considered as a wedge applied to the circumference of a cylinder, so this may be viewed as a wedge applied to the circumference of a frustum of a cone, and may be called a conic or wedge-screw. AB is such a screw, tapering from A to B, and having precisely the same interval between all the turns of the thread. The head is furnished with holes for handspokes to work the screw with. CD is the nut, formed in two parts, which separate easily. The eye of the nut is a frustum of a hollow cone, accurately similar to the smaller extremity of the screw, as far as regards the angular inclination of the sides of each to their respective axes, as seen in a longitudinal section; but different in this, that when the screw is inserted into the nut, the former is only a tangent to the latter. When the screw is inserted and worked round, it gradually forces the parts of the nuts asunder until the thicker end has come between them, when the surfaces of the nut and screw must be found to coincide.

In the figure the arcs F, F′ and G, G′ are arcs of a sectional circumference of the thickest part of the screw. A section of the smaller end is seen as inserted in the nut; the dotted circle *b*, *b′* is a section of the body of the screw, and the outer circle, *a*, *a′*, &c. is one of the threads of the screw, partly seen, and partly hid by its engagement in the nut. This screw seems equal to any thing, either as a producer of force, or as a measurer of minute distances: it seems also to have this peculiar advantage, that the smaller the angle of inclination of the sides, viz. the greater the power exerted, the more the threads are relieved from the burden of the pressure. As a mover of weight, the following estimate may be made of its power:—

Taking the length of the screw at 3 feet, independent of what enters the nut before action, the number of threads in that length as 30, the distance from the centre of the head to the end of the handspoke at 4 feet, and the difference of the diameters of the greater and less ends at 1 inch, then the resultant power will be about 259,200lbs. or upwards of 115 tons, taking the working-power at 30lbs. As a micrometer, I beg to add the following estimate of its performance:—

Taking the length of a quarter degree on a common seaman's quadrant at $\frac{1}{10}$ of an inch, the length of the conic screw at 1 inch, the difference of the sectional diameters of the ends of the screw, and $\frac{1}{10}$ of an inch, and supposing the head of the screw to be divided into 100 parts on its limb; then we shall have a degree divided to the $\frac{1}{800}$th part, or into less than half-seconds. supposing the thread to make 20 turns in the inch.

I am, Sir, your obedient servant,

Φ. M.

MODE OF OBTAINING VARIOUS-SIZED PRINTS FROM ONE PLATE.

Sir,—I think it due to Mr. Babbage to observe, that on p. 84 of his work on the "Economy of Machinery," he describes the method of obtaining various-sized prints from one plate, mentioned for "the better information of your readers" by T. D. L. in your Number of to-day. Mr. B. does not, indeed, speak of it as having been "confidently stated," but its having been "conjectured" that such means were employed.

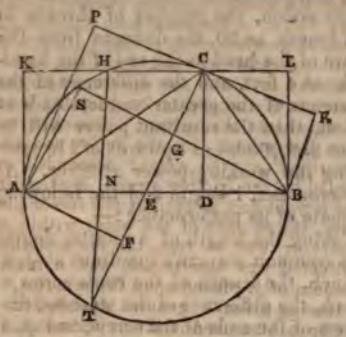
In the absence of all knowledge of the engravings except that derived from Mr. Babbage's description, I would ask what *proof* there is that the several-sized impressions *were* all taken from *one* plate? I am inclined to suspect the truth of the story; and my suspicions are not lessened by a remark in Mr. B.'s work, that "in another set of specimens, consisting of a map of St. Petersburgh of several sizes, a very short line, evidently an acci-

dental defect, occurs in *all* the impressions of *one particular size*, but *not in any of a different size.*"

Yours, &c. S. Y. (an Engineer).

September 1.

SOLUTION OF THE PROBLEM PROPOSED BY THE "LIEUTENANT OF ENGINEERS."



Sir,—The errors noticed by a "Lieutenant of Engineers," in the enunciation of the 2d and 3d problems on the maxima and minima of geometrical quantities, vol. i. of the last edition of the Woolwich Course, are easily rectified. In the 2d, for maximum read minimum; and in the 3d, for minimum read maximum; then all will be right. The construction, &c., will be as follows:—

About the triangle ABC describe a circle, and through C draw the tangent PCR; draw AP, BR, perpendicular to PR, then shall AP + BR be a maximum. For through C draw any straight line KCL, cutting the circle in C and H, draw HNT perpendicular to AB, join CT and draw AK, BL, AF, BG, CD, perpendicular to KL, CT, and AB, and let BG meet the circumference in S; join AS.

Because PR touches the circle, the $\angle$ ACP = CBD = ACD and the angles CPA, CDA, are right angles $\therefore$ AP = AD for the same reason BR = BD. Hence AP + BR = AB. Again, because HNT cuts the diameter AB at right angles $\therefore$ the $\angle$ ACH = ACE $\therefore$ AK = AF, also BL = BG (by the Lieutenant's demonstration); and since the angles at the points S, G, and F, are right angles $\therefore$ SF is a rectangle; hence, SG = AF $\therefore$ BL + AK = BG + AF = BG + SG = BS; but AB is greater than BS $\therefore$ AP + BR is greater than BG + AF, or greater than *BL + AK*, $\therefore$ *AP* + BR is a maximum.

After the above solution of Dr. Gregory's problem, that of the Lieutenant's becomes very easy.

From the point B apply in the circle ABC a straight line BS = to the sum of the required perpendiculars, and draw the chord CT perpendicular to BS, and construct the figure as before, then it may be demonstrated, as above, that BL + AK = BG + AF = BS.

From the construction it appears, that the sum of the perpendiculars must not be greater than the diameter AB; and, from what the Lieutenant himself has stated, if BC is the least side of the triangle ABC, the sum of the perpendiculars must be greater than BC.

The Lieutenant's problem may be made more general by supposing ABC to be any rectilineal triangle whatever.

Let ABC be the given triangle. It is required to draw from or through the angular point C a straight line, such that the sum of the perpendiculars drawn from B and C upon it may be equal to a given straight line.

Upon AB describe a semicircle, in which place BS equal to the given sum of the perpendiculars, produce AC to R, making CR = AC, join BR, and upon it describe a semicircle, in which apply BL = BS, and from and through C draw CG, CP perpendicular to BS and BL; join AS, LR, and draw AK, RT, AF perpendicular to CP and CG produced.

Then because the angles at the points S, G, and F, are right angles $\therefore$ SF is a rectangle and AF = SG $\therefore$ BG + AF = BS. For the same reason, RT + BP = BL = BS, and comparing the triangles AKC, and RCT, we have RT = AK $\therefore$ AK + BP = BG + AF = BS.

Yours, &c.

KINCLAVEN.

P. S. The limits of possibility of the above problem are abundantly obvious from the construction.

August 20, 1832.

REPORT OF THE COMMITTEE OF THE FRANKLIN INSTITUTE OF PENNSYLVANIA, APPOINTED MAY, 1829, TO ASCERTAIN, BY EXPERIMENT, THE VALUE OF WATER AS A MOVING POWER.

(Continued from Vol. XVI., P. 161.)

Method of Conducting the Experiments.

A general statement of the methods of experimenting will now be given.

One person was stationed upon the upper platform, specially charged with regulating the head of water in the forebay; this he did by means of the levers d', g, and e', g, (Fig. I.) controlling the stop cocks, b, and b', in the supply pipes, or when the level was too high, by letting off as much water as was required to reduce it, through the waste valve h, Fig. II.; the head was ascertained by the float h, Fig. I., tape line, h, h', h'', and index, i, already described. The same person being always employed in this duty was, by practice, enabled to preserve a required head, subject to a variation of not more than a quarter of an inch, during any one experiment. The same operator opened and closed the gates for letting the water upon the wheel, and regulated the position of the chain during the descent of the basket so as to bring it back to the elevated end of the roller, by turning the arms m, m′ and m, m″, connected by the rope l′, l, k″, with the slide, k′, k″, carrying the pulley k, (Fig. III.)

A second assistant was placed upon the lower platform, N, O, O′, (Fig. I,) who had in charge the regulation of the break or friction strap, and the closing or opening of the tail-race valve, u, u', for collecting, or suffering to run to waste, the water used by the wheel; he also placed the proper weights in the basket, allowed the escape of the water from the reservoir when necessary, &c.

A third person attended to note the circumstances of each experiment, to observe the time occupied, the quantity of water in the reservoir, as shown by the gauge rod, and to make the necessary calculations.

When an experiment was to be made, the moveable plate, r, r'', (Fig. I,) of the reservoir gauge was set to the mark on the gauge rod next above the loop. One of the gates for letting the water upon the wheel, was then opened, and the wheel suffered to revolve, with a full supply of water, until the basket was raised sixteen feet; by this time all the moving matter had acquired an equable motion, and the first mark upon the chain *coincided with the indicator* p, p′; at this instant the second operator closed the tail race valve, in doing which he rang the bell, a, the signal for the third operator to note the time. The first operator now carefully kept the water in the forebay, at a constant level. The water used by the wheel passed into the reservoir, R, S, T, Q, until the second mark on the chain coincided with the indicator, when the second operator opened the tail-way valve, at the same time causing the bell, a, to ring, thus giving notice to the third operator to mark the time, and to the first to close the aperture admitting water to the wheel, and to stop the influx of water into the forebay. The chain was then drawn back, by the pulley and slide described, as the weight descended retarded by the friction strap. By the time the weight had arrived at the lower platform, the surface of the water within the reservoir was at rest, the amount there collected was ascertained, and a memorandum of it placed upon the minutes.

Having given a general description of the apparatus used in the experiments, the Committee proceed to state the methods employed in estimating the resistance arising from friction.

Experimenters have differed in the results of their investigations of the laws of friction. It results from the experiments of Coulomb, that the friction at the axle of a wheel, or of a roller, varies in the direct ratio of the pressure upon the axle, except in extreme cases. The late experiments of Mr. Rennie* indicate, that when unguents are used, the ratio of friction to pressure is not the same for different pressures, the variation depending upon the nature of the unguent and the amount of pressure applied.

The Committee deemed it necessary, therefore, to determine with the apparatus to be used in their experiments, and under the probable loads to which it would be subjected, the relation between the friction and weight. It will be seen that this labour was much abridged by the fact that the experiments showed the ratio of friction to pressure to be constant, within the limits required by the investigations.

The experiments of Rennie have satisfactorily established that the friction of an axle remains the same, in proportion to the weight, under different velocities.

The frictions to be estimated by the Committee, were those at the axis of the water wheel, and at the axis of the roller or drum, above the wheel.

To ascertain the amount of friction at the axis of the wheel, a cord was wound

* Transactions of Royal Society of London, Part I, 1829, pp. 163 and 164; or Journal of Franklin Institute, Vol. V., No. 2.

about the barreling of the shaft; to this cord was attached a weight varied until it just maintained a velocity of six feet per second in the periphery of the wheel; the weight, thus found, gave the friction upon the gudgeons, when pressed by the weight of the wheel together with the weight representing the friction. The pressure upon the gudgeons being increased, by attaching masses of lead to the wheel at equal distances from, and on opposite sides of, the axis, the friction was found in the cases tried, viz. those within the probable limits of the weights to be borne in the experiments, to be proportional to the weight sustained by the gudgeons of the wheel. The proportion of friction to weight was found to be one and a half per cent.

The friction at the axis of the drum was ascertained by passing a cord over it; to the ends of this cord weights were attached, and the additional weight necessary to cause either extremity to descend with a uniform velocity, gave the amount of friction. By varying the weights at each end of the cord, it was found that in this case, as in that of the wheel, the friction was proportional to the weight borne by the gudgeons, and that the proportion of friction to the weight was one and a half per cent. This latter circumstance tends, as well as the former, to simplify the calculations relating to friction.

The weights having been raised by the wheel through the intervention of a chain passing over a drum above, it is evident that the axis of the wheel was drawn upwards with a force due to the tension of the chain between the axis and the drum, that is, to the weights attached to the chain, thus diminishing the pressure upon the axis of the wheel, and lessening, in consequence, the amount of friction; but this tension increased the pressure upon the axis of the drum, and since the friction at that axis, by a given weight, was the same as that at the axis of the wheel, these two opposite effects balanced each other, and there remained the friction due to the weight applied to the chain.

As reference is necessarily made, in the calculations which follow, to the centres of gravity of the loaded parts of the wheel, it may not be amiss to state the manner in which these points were determined. The general remarks apply to the several wheels used, but the details refer to the largest wheel.

The water was supposed to be distributed uniformly over the loaded part of the wheel, a supposition very nearly accurate, when the buckets are numerous and the wheel works within a close breast. A section of the wheel perpendicular to the axis, and midway between the rims, being taken, the weight of the water was supposed to be concentrated in that part of the periphery of a circle, a mean between the circles containing the interior and exterior edges of the buckets, which corresponded to the loaded part of the wheel. In Fig. I, *a*, *b*, *g*, represents the semi-circumference of this circle, a mean between the semi-circumferences A, D, F, I, and K, L, M, of Fig. 1, the radius being 9 feet 9 inches in the case figured, viz. that of the large wheel. To find the arcs corresponding to the loaded portions of the wheel, this circle was described upon a large scale; the several points answering to those at which the water, admitted to the wheel through apertures, Nos. 1, 2, &c. (Fig. 1,) first struck the wheel, were laid down, as at *a*, *b*, *c*, *d*, *e*, and *f*, (Fig.), the lowest point of the wheel, *g*, being taken as the point at which the water was discharged, the arcs sought were *acg*, *bcg*, *cdg*, *deg*, *efg*, and *fhg*. The centre of gravity of each of these arcs, was then found by the usual method. The diagram shows the chords, *ag*, *bg*, *cg*, &c., from which the lengths of the arcs were obtained, the lines bisecting these chords, and upon which the centres of gravity of the arcs are to be found, *ci*, *ck*, *cl*, &c., and upon these lines the points corresponding to the centres of gravity, viz. G, G′, G″, G‴, G^{iv}, G^{v}. By drawing lines parallel to *ag*, from the points thus found, the distances from the axis of the wheel, obtained by calculation, are shown upon the scale traced in the figure.

We shall now give the calculations of the amounts of resistance from friction, in the wheel and drum, under the various loads to which they were subjected in the course of the experiments.

First. Constant *inactive* weight borne by the gudgeons of the wheel and drum during the experiments.

Weight of the water wheel . . .	2200 lbs.
The whole weight of the chain was 318 lbs.; of this an average weight of 34 lbs. (20 feet of the chain,) rested upon the ground during each experiment, and that part of the chain between the barrel of the shaft and	

the ground (20lbs.) acted to resist the motion of the wheel —deducting, therefore, 54 lbs. from the weight of the chain, we have for the constant *inactive* weight upon the gudgeons of the wheel and drum, derived from the chain,	264 ,,	
Weight of the drum	200 ,,	
Total constant inactive weight	2664 lbs.	
The friction upon this, at one and a half per cent, is		39.96 lbs.
Second. Constant weight *resisting* the motion of the wheel, which was borne by the gudgeons of the wheel and drum.		
That part of the chain which was between the barrel of the shaft of the wheel and the ground	20 lbs.	
The iron basket used to contain the weight	126 lbs.	
Three bars of lead, weighing together	111 ,,	
Total constant resisting weight	257 lbs.	
Friction due to this weight at one and a half per cent		3·85 lbs.
The total friction derived from the constant weight, is, therefore,		43.81 lbs.

(To be continued.)

OBSERVATIONS ON A NEW METALLIC SHEATHING FOR SHIPS' BOTTOMS, BY MR. ABRAHAM BOOTH, PRACTICAL CHEMIST, AND LECTURER ON CHEMISTRY, &c.

Of all the various topics of useful and practical enquiry, which come within the range of scientific investigation, there are, perhaps, few more intimately connected with the commercial spirit of enterprise of this country, than those which relate to naval architecture. The attention of the Government, and the private exertions of individual enterprize, have very laudably been directed towards this subject during the last few years, and the eagerness with which the public bestow their patronage and attention upon any attempts at improvement, whilst it may be considered an earnest of the importance of the subject, is also a proof that it amply deserves the attention, and requires the judgment of a discriminating scientific press.

Amongst other individual branches of inquiry, the sheathing for ships' bottoms, has occupied no inconsiderable share of attention. To devise some means whereby the timber might be preserved from injury, from general or accidental circumstances; but more particularly from that of marine worms, and other productions, was the first object of attention in the infancy of naval architecture, and this was first effected by the hides of animals, covered with pitch or asphaltum; but the successive developements introduced by the progress of naval and commercial intercourse, soon brought into requisition the use of metallic sheathing, as being the most durable, and the most eligible and practicable in effect.

Although the use of leaden sheathing was first adopted in the English marine, copper has more latterly been exclusively applied for this purpose. The expense, however, attendant upon the use of this metal, in consequence of its rapid degree of corrosion and decay, when in contact with salt water, has always been found a most serious objection to its use; and to remedy which, various suggestions and numerous experiments have been made, but without success. The corrosion of the metal is found materially to vary in different anchorages, dependant upon local circumstances, or upon the quantity of decaying organic matters contained in the water, and which greatly facilitates the oxidation and solution. At Sheerness, the rapidity of decay is very great, in consequence of the copper being subjected to the alternate action of the sea, which flows in there from the Bristol Channel, and to the flux of water down the Thames and Medway—loaded, as they undoubtedly are, with the products of animal and vegetable decomposition. A very general belief formerly prevailed, that sea water had very

little or no action on pure copper, and that the rapid decay of that metal on certain ships was owing to its impurity; but the converse has been proved to be the fact, as the attempts to purify the metal, which have proved successful since the Government have manufactured its own copper sheathing, has unquestionably been the cause of its more rapid decay. Alloys of copper have generally been proved the most durable; and various patents have at different times been taken out for the fabrication of such compounds; but metalic sheets so formed, have uniformly been found too hard and brittle for practical use, and not to admit of that flexibility, which is so necessary for their application to a curved surface, and the consequence of which has been, that they have uniformly cracked upon the ship's bottom.

The remedy that presented itself to Sir Humphrey Davy, was, that the corrosion of the copper sheathing might be prevented by rendering the copper electro-positive, by means of the contact of tin, zinc, lead, iron, or some other easily oxidable metal This was what the superiority of the use of impure copper, or copper alloys, would seem to indicate.

Sir Humphrey Davy undoubtedly deserves credit for the zeal and talent with which he prosecuted his investigations; and, although the truth of his remedy was only established by the failure of his experimental trials, yet it pointed out the correctness and value of that train of investigation, by which alone we can hope to obviate a defect so very serious in naval economy.

I have prefaced these observations as an introduction to a new metallic sheathing, proposed for ships' bottoms, and for other purposes, for which iron, tin, and lead are applied; and where these easily oxidable metals are exposed to the action of water on the atmosphere, as in verandas, or on roofs; because it points out the advantages and applications to which our knowledge of the electric states of metals, and metallic combinations, may be extended, and in many cases with peculiar advantage and interest.

My own experiments upon this combination, enable me satisfactorily to recommend it to your notice, as likewise to those of your readers who are engaged in objects of naval intercourse, as it is *evidently not* acted upon by any of those agents, or in any of those circumstances to which it is exposed from its employment or application. It is the invention of the manufacturer, Baron Wettersdett, a gentleman who can claim the honour of being fellow pupil and associate in chemical studies, with his illustrious countryman Berzelius; and it may, therefore, with justice, be presumed that it is the result of some degree of scientific industry and investigation. It is likewise some satisfaction to observe, that this celebrated philosopher has expressed a favourable opinion respecting the merits of this invention in a letter to the manufacturer.

The marine sheathing I have verified on analysis to be an alloy of lead, antimony, and quicksilver, and the combination of these metals is such as not only to preserve them from oxidating, but also to impart to the composition, peculiar qualities of cohesion, tenacity, and elasticity, not possessed by copper or its alloys in general, and which render it highly eligible for the purpose to which it is applied. The cohesion of the particles is not destroyed by a violent strain or blow, as in copper, but being highly elastic and tenacious, the metal adapts itself to the force of the percusssion. Its tenacity gives it a ready adaptation to surface, which is of very considerable value, not only in first covering the vessel, but has also proved to be very effectual in obviating the effects of any accidental strain, which the vessel may receive during her passage, and which, under ordinary circumstances, might prove instrumental to the loss of the ship and cargo, and would, I doubt not, be found equally so in case of its being driven on the surfaces of rocks or sands. Although the outward surface of the vessel remains perfectly clean and bright, like silver, there is, under no circumstances, any adhesion of barnacles or marine productions, which were found so great a source of obstruction in the experimental trials with the Protector, notwithstanding the *a priori* conclusions of Sir Humphrey Davy, that a negative state of electricity would be unfavourable to vegetable life or production. It may likewise be observed, that the combination acquires additional hardness by being in continual contact with sea

water; that the price for sheathing a vessel is considerably less than that of copper, and that this is far more durable.

In this, as in similar cases, practical men are best gratified with practical proofs, and as no train of investigation or philosophical reasoning can be considered perfect unless supported by such testimony, this being now a matter of extensive practise and experience, I have appended the following testimonials, copies of which I received on a late visit to the manufactory, and which, I have no doubt, will satisfy the readers of the Mechanics' Magazine of the merits of this new invention.

Plymouth, Aug. 2, 1832.

"The bark, Royal William, Captain Thomas Peake, having been lain on the ground in Stonehouse Pool, we, the undersigned, have this day attended alongside and under the bottom of the said ship, for the purpose of examining the state of the patent marine metal sheathing which was put on the Royal William at this port in March last, since which the ship has performed a voyage to Prince Edward Island, and back; and we declare, after a minute inspection, we find no more the appearance of corrosion than would have appeared on the best copper sheathing for the same time. It is quite bright, free from grass, barnacles, or shells; and, although a few sheets were gone down the bows, it is our belief that this arose from want of sufficient nails, as the ship struck the ice on her passage out. We have no doubt whatever, that the patent marine metal will answer well for sheathing ships.

(Signed.)

W. Cumming, Surveyor of Shipping, and Sub-Commissioner of Pilotage.
T. Peake, Capt. Royal William.
G. Peake, Owner of the Ship.
C. Cumming, Ship-owner.

Plymouth, Aug. 8, 1832.

The Reward of this port having grounded on the coast of Cornwall, near Penzance, and during which time a very heavy surf was running on the shore that filled the boat alongside, and shook the schooner to a great degree. I declare it to be my belief, that the patent marine metal, from its elasticity and the tarred paper between it and the vessels' bottom, was the cause of my saving the said schooner, and getting her to the port of Plymouth. The keel of the keelson and some timbers being broken, and the vessel so much strained, that she appeared to be kept afloat wholly by the patent sheathing and paper.

(Signed.)

Nicholas Goss, Commander of the Reward.

Newcastle, June 23, 1832.

I am happy to say, the Relief has arrived at Sunderland in the best possible condition. A portion of the new sheathing has been taken off her, and appears quite unaffected by exposure, whilst the copper placed to secure the edges of the marine metal was completely coroded and destroyed. The vessel sails again to-morrow for Archangel. I understand that a sheet has been taken off her to send for exhibition to the Baron, which, I doubt not, will be attended with particulars. The piece sent to me is not more affected than that which you showed me at Limehouse. The owner of the Relief intends to have another vessel of his sheathed in a similar way; and I shall be glad to learn that the application of this new sheathing for ships' bottoms increases with experience, and that the inventors may be amply remunerated.

(Signed.) T. Crawhalle.

NEW STEAM-CARRIAGE.

Sir,—Having seen a clear and mathematical *demonstration* in the Mechanics' Magazine of the impossibility of a steam-carriage going up hill on common roads, I beg to inform you that yesterday I went on such a carriage—invented and constructed by Colonel Macerone and Mr. John Squire—six miles out and six miles back on the Harrow-road, up and down several sharp and long hills, in less than one hour. It run at more than eight miles the hour up the steepest hills; and on the levels, when the road was clear, at more than sixteen. The steam was so abundant as to be blowing away at the safety-valve *the whole* of the journey. The boiler is, I understand, a new combination of tubes, perfectly free from the defects and objections attaching to those made by Gurney and others, utterly incapable of doing any mischief, even if it were to burst. The steam is usually at a pressure of 150lbs. to the inch; but the boiler has stood 1000lbs. to the square inch. The boiler weighs only 1700lbs.; the whole carriage about two tons and a quarter. What will "Saxula" say to this? He may have a ride any day at 3 o'clock, by calling at No. 19 Wharf, Paddington-green.

Your obedient servant,

V. S.

P. S. The above carriage is the *first* constructed on a *new* principle. They tell me that the next built will have, at least, one-third more power, with the same bulk and weight.

Hint to Tea Makers.—Put a small quantity of carbonate of soda into the pot along with the tea, and this, by softening the water, will accelerate the infusion amazingly. Should the water be hard, it will increase the strength of your tea, at least one half.

Mortar Firing.—Two officers of engineers at Metz have discovered a mode of imparting so steady and certain a direction to the course of bomb shells, that their fall at a given point may be calculated with mathematical precision. The experiments which have been made, with a view to ascertain the merits of this new system, are said to have been attended with complete success.—*French Paper.*

The False Horizon is the name given to a very ingenious instrument recently invented by Captain W. F. W. Owen, R. N., and manufactured by Jones, of Charing Cross. The artificial horizon, as astronomers are aware, furnishes the means of measuring accurately such celestial altitudes only as are not less than fifteen, or greater than sixty degrees. The false horizon is intended to make up for this deficiency. A polished plane or speculum is so inclined to the natural horizon as to increase all altitudes when under fifteen degrees, and diminish them when above sixty; that is, it creates an error, the quantity of which may be constantly known, or easily ascertained. It is not intended to supersede the use of more precise instruments, but to put an additional new and convenient mode of observation within the reach of voyagers and travellers.

Steam Travelling.—The Dowlais Iron Company's steam-carriage, "Powerful," lately left the Dowlais works for their basin, a distance of 11 miles, with 126 tons of iron attached to it, exclusive of engine, tender, and trains, together more than 200 tons; the "Powerful" returned with 47 empty trains, and performed the journey to and from within 12 hours.—*Bath and Cheltenham Gazette.*

Iron Roofs, as constructed in Russia.—In the last Part (IV.) of Mr. Loudon's Encyclopædia of Cottage, Farm, and Villa Architecture, he quotes from the Repertory of Patent Inventions, an account of a mode of covering iron roofs, common in Russia. By referring to the Mechanics' Magazine, No. 434, Mr. L. will perceive that our esteemed correspondent, Mr. Reed, of the Peterhoff Paper-mill, was the original author of the account in question, and that it has been copied (we presume, without acknowledgment) from the Mechanics' Magazine, by the Journal which has erroneously received credit for it.

A New Comet.—Dr. Forster states, that although Encke's Comet has disappointed the astronomers this year, a new comet has been observed in the Serpent, which is now travelling rapidly southward. It is small and without any distinct coma, which accounts for his mistaking it (as indeed other observers did also) for a mere nebulous appearance, some little time ago. Encke's Comet, which was foretold, has been missed; but Biela's Comet is yet to come, and he has very little doubt but that it will be seen late in September, as its perihelion passage will occur, according to calculation, on the 29th of November.—*Essex Independent.*

Fire-Sparks from the Magnet.—At a party where we lately saw Mr. Farraday striking out sparks in great abundance from his gigantic magnet, every attempt at igniting gunpowder failed. Since then we are informed that Dr. Ritchie, by the application of a simple mechanical arrangement, has succeeded in exploding a mixture of oxygen and hydrogen gases by the spark so obtained.—*United Service Journal.*

Long Shots.—The longest shot upon record, was that of the Lancashire archer, who shot his shaft a mile in three shots. This has been nearly equalled within these few years. A Turkish ambassador in London discharged an arrow 480 yards; and a Turk, at Athens, shot his shaft 584 yards, which is only 3 yards short of one-third of a mile.—*Ibid.*

A Yellow Gunpowder was lately introduced among the American hunters, which was found to burn eight times quicker than the ordinary gunpowder, and to throw ball and shot with far greater accuracy and steadiness. The manufacture of it was, however, attended with so much danger, that the person who introduced it (Mr. Guthrie, of Sacket's Harbour), was obliged, after some eight or ten tremendous explosions, by which he had nearly lost his life, to give it up. It was found, also, that its superiority was confined to certain limits, for an equal charge of it did not project a ball with more than one-half the force of black powder. It was formed by melting to a waxy consistence, 2 parts of nitre and 1 of carbonate of potash, and when the mass was cold, adding to 4½ parts of it 1 part of sulphur, and then reducing the whole to powder with a small wooden cylinder.

INTERIM NOTICES.

The maker of the article alluded to by "A Town Traveller," failed in business, and the manufacture of it has not (we believe) been as yet taken up by any body else.

We have examined Mr. H. S.'s "Geometrical Rule for ascertaining the quadrature of the circle," and though, of necessity, wrong, we must do him the justice to say, that it is much less so than the majority of the plans for that purpose with which the scientific world has been from time to time amused. The nearest mechanical approximation we have ever seen, was that proposed by Major General Ousley, in our 13th vol. p. 116.

"Ex-Cam." must be some stranger in Ireland, trying to catch the genius of the country. Speaking of maxima and minima, he says, "You can never tell what to make of a quantity till—*it vanishes into nothing!*"

If "Thoughtful" had given his plan for the improvement of Mr. White's Counting Machine, "thought" enough, he would have discovered the impracticability of introducing such a drawing as he has sent with it into pages of the size of ours. Could not a description, without an engraving, suffice?

The expense and trouble of reducing the ideas of "A Country Rector" to practice, would be so very trifling, that we think he is bound to subject them to this test before bringing them under public notice.

It appears that we were wrong in inferring from some expressions of Mr. Hiort's that he "is a stranger to the British isles." He assures us that that he "drew his first breath within the sound of St. James's Bells." Well, such being the case, we shall be content if the ear of corn, 20 per cent. enlarged, be stuck up on the gates of St. James's Palace, instead of at the Corn Exchange. We take this opportunity of adding Mr. H.'s apology for any delay that may, perchance, occur in respect to this exhibition. "You call upon me somewhat sneeringly to stick up an ear of corn at Mark Lane or the Corn Exchange; and so I would if an ear of wheat was like the Mechanics' Magazine, and could be produced in a week (!) but there is a time and a season for all things, and that time and season I am watching." He speaks truth; there is a time and season for all things—for subscribing, among others, for what the Scotch call "a pig in a pock."

Communications received from Mr. Batley—R.—J. W. H.—S. T.—Marcus—Iver Maciver—A Woolwich Cadet—Mr. Symington—L. W. D.

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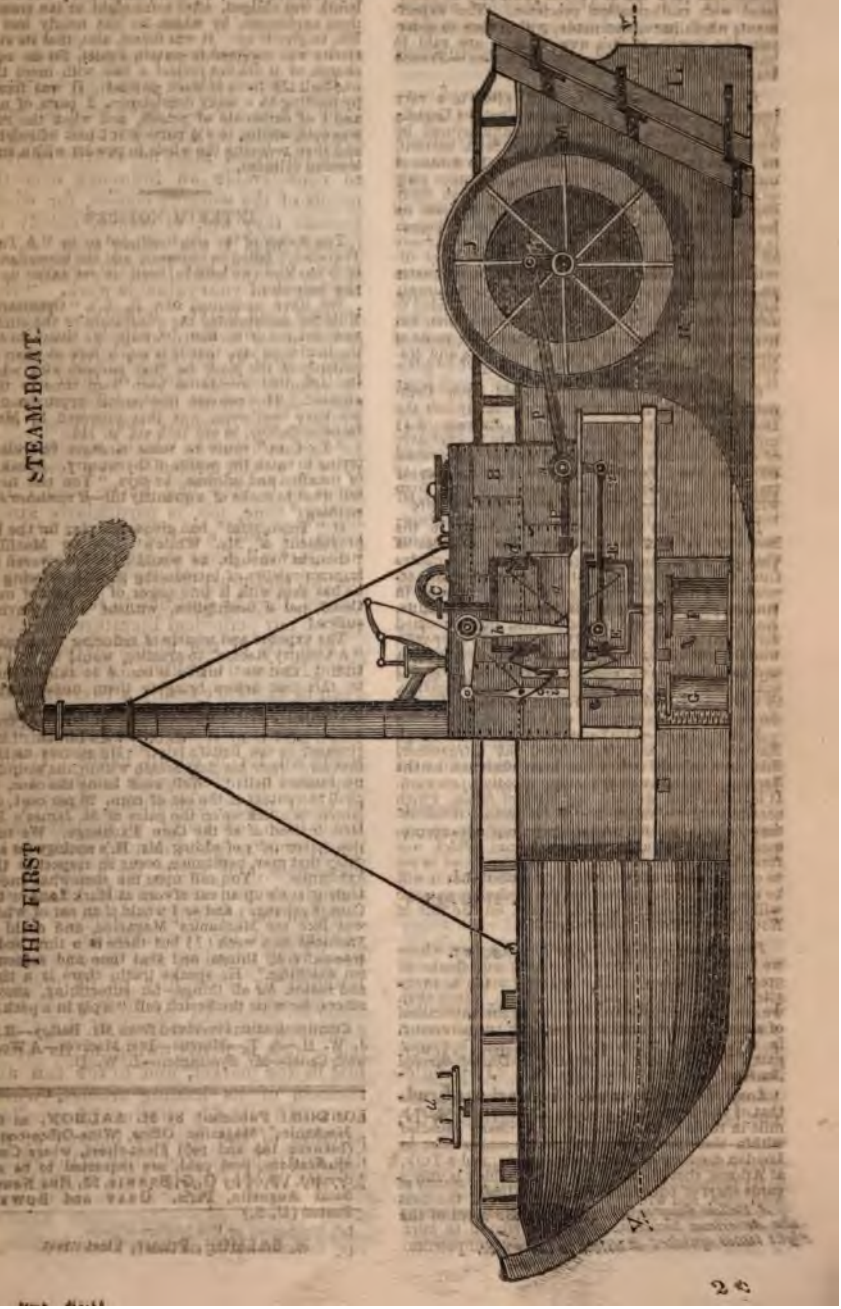
Mechanics' Magazine,

MUSEUM, REGISTER, JOURNAL, AND GAZETTE.

No. 475.] SATURDAY, SEPTEMBER 15, 1832. [Price 3d.

THE FIRST STEAM-BOAT.



THE FIRST STEAM-BOAT.

Sir,—The drawing sent herewith represents the *Charlotte Dundas* steam-boat, and her machinery, constructed by my father, the late William Symington, Civil Engineer.

She was formed for the purpose of towing vessels on the Forth and Clyde Canal; and afforded, in 1803, satisfactory proofs of her capability by dragging two laden vessels, of 70 tons burthen each, 19½ miles in 6 hours, against so strong a head-wind, that no other vessel could proceed that day in the same track.

The late Robert Fulton, the American engineer, was on board the *Charlotte Dundas*, took sketches of her machinery, and received ready and explicit answers to the questions he thought proper to put. Several years afterwards his first boat appeared in America.

Prior to the *Charlotte Dundas* two exemplifications were afforded by my father of the practicability of the adaptation of the power of steam to the purposes of navigation: the first in 1788, on Dalswinton Lake; the second in 1789, on the Forth and Clyde Canal.

Two circumstances may be worthy of notice:—First, the *Charlotte Dundas*, to prevent accidents, was steered at the stern; second, the idea of making steam subservient to navigation originated from witnessing the performance of a model for a steam-carriage, which, in 1784, he had invented, and, in 1786, submitted to the inspection of eminent scientific and learned gentlemen in Edinburgh.

Should these facts be deemed interesting, their insertion in your widely-circulating Magazine will oblige

Your most obedient servant,

W. SYMINGTON.

Bromley, Middlesex, Sept. 4, 1832.

Description of the Engraving.

A, cylinder. B, boiler. C, steam-pipe. D, steam-valves. EE, exhausting-valves and eduction-pipe. F, condenser. G, air-pump. H, air-pump lever. I, hand-gear and pump rod. J, paddle-wheel. (*a*) K, crank. L, starboard-rudder. (*b*) MM, paddle-wheel cavity. (*c*) N, friction-wheels. PP, piston and connecting-rods. (*d*) T, Armand-rod. (*e*) U, steer-wheel. VV, flotation-line.

(*a*) Contained in the paddle-wheel cavity.

(*b*) Connected to the larboard-rudder by means of iron rods, and wrought in the forepart of the boat by a steer-wheel in the centre of the stern of the vessel.

(*c*) Open behind and below to the water.

(*d*) Supported by the friction-wheels.

(*e*) Communicating motion to lever.

THE PENNY PRESS.

Sir,—The cheap periodical publications which are, and have been for some time, issuing, in unprecedented numbers from the press, must necessarily exercise so considerable an influence over the minds of the working classes, for whose perusal they are, of course, chiefly intended, that I am rather surprised no notice of them has hitherto appeared in the pages of your valuable work. "Better late than never," however. Perhaps you will allow me to supply the deficiency; and, by giving an early insertion to the following sketch of their history, show that you are not indifferent to the subject, and preserve some record of a race of ephemera, which, without such record, would, probably, in a few years, seem as if they had never been. The present time, too, is particularly auspicious for such a notice, as the "penny publication" fever seems just now at its height, and must shortly decline; unless, indeed, they be destined to supersede the rest of our periodical literature entirely.

The first of the numerous band was the "National Omnibus," which has now been in existence nearly a twelvemonth; although, at its commencement, a "short reign and a merry one," was confidently predicted for it on all hands. It then appeared quite impossible to afford a folio of eight pages, containing, besides extracts from new books, no inconsiderable quantity of original matter, written with cleverness and spirit, for a penny, although its projectors should chiefly depend on the profitable commodity of advertisements for remuneration. It still keeps up, however, and sees itself surrounded by some fifty of its progeny, successors to some fifty more, which have already gone to the tomb of the Capulets:—this is partly owing to its being first in the market, and to the fun and raciness of its leading articles, which are usually thickly strewn with excellent parodies of the popular ballads of the day, said to be the production of the editor, Mr. F. W. N. Bayley, the well-known

lyrist. The serious poetry by the same practitioner, is, however, mere rubbish, and the serious prose not unworthy of the poetry, and often displaying the most astounding ignorance:—in one number we have been told that Hobart Town is the capital of New South Wales; and in another, that the Rambler was written by Addison and Johnson in conjunction! Altogether, however, the Omnibus gives its passengers an entertaining journey for very little money; the worst part of the business being, that, as all comers in the advertising line are admitted, the fun too often finds itself in juxtaposition with filth. This should be looked to, and reformed.

The "Omnibus" no sooner seemed to succeed, than a competitor appeared in the "Entertaining Press"—a plagiarism in every respect. This has disappeared; but a third rival, the "New Entertaining Press," also of the same size, plan, and price, still keeps the field, and not undeservedly. Its articles are more of the serious cast, and often contain a good deal of information, as well as amusement. It is well got up, and gives a plate in every number.

"Figaro in London" is a political squib (said to be edited by the dramatist Moncrieff) which obtained a large circulation during the Reform excitement. Its chief attraction consists in the caricatures, designed by Seymour in a style of broad humour, worthy of George Cruikshank himself. "Figaro" had several imitators, but they have all disappeared since the return of comparative quiet in the stormy world of politics—*Requiescant in pace!*

The impulse given to cheap literature by the appearance of the Omnibus had nearly spent its force, when "The Society for the Diffusion of Useful Knowledge" stept on the scene. The "Penny Magazine" was announced, and all was expectation. At length the monster appeared; and this cheapest possible production of a society supported by public subscription, was found to be nearly twice as dear as those of mere private speculators, who depended merely on the sale of their works for support. The contents, too, were not so very amazing; if they were to be considered as the product of the long array of Lord Chancellors, Cabinet Ministers, Noble Lords, Right Honourable Gentlemen, distinguished philosophers, dignified clergymen, celebrated authors, and liberal characters of every shade, whose names invariably grace the covers of the Society's works. After a pompous and inflated address, we had a dry description of Charing Cross, with a miserable cut; (somehow or other the Society are singularly unfortunate in their embellishments) an account of Van Diemen's Land, which, being taken from the Hobart Town Almanack, afforded *such an opportunity as the Society never let slip*, of admiring their own highly-correct British Almanack, and depreciating the rival one of that million-selling scoundrel, "Francis Moore, physician;" an article on the Antiquity of Beer, second-hand from the Society's Library of Entertaining Knowledge; two old Joe Miller's, grey-headed acquaintances, only murdered in the telling—one about the Italian Marquis and the Fisherman, who *would* have a hundred stripes for his turbot; and the other, the Sermon on the word Malt! Here was novelty—here was a proof of the advantages of a learned Society undertaking the task of enlightening the lower orders—here was a sample of the heretofore-inaccessible information "now set within the reach of the humblest among them." Can they be sufficiently grateful for such condescension, and ought they not to pass an unanimous vote of thanks to their benefactors, with a request for frequent drafts from those scarce and expensive works, "the Fun Box Broke Open," and the "Oddest of all Oddities?" Seriously, was such a hash as this, seasoned with one or two more second-hand articles from the Society's own Entertaining Library, a piece of "select poetry" from Crabbe, and a dry statistical sketch of Poland, such a miscellany as we had a right to expect from the many-headed Useful Knowledge monster? Was it necessary for half the wise heads of the nation to club their wits for the concoction of such a mess as *this?* Yet of such does the Penny Magazine usually consist. Occasionally, indeed, there are articles of a better sort, but these are disfigured by a ridiculous affectation to which the Society, or their representatives, are unfortunately subject, more especially in this work, and in the Working Man's Companion,—the affectation of speaking down to the level of the meanest capacity—of treating the former

nate mechanic who can attain to the perusal of their "great pennyworths," as a sort of grown-up child, who must be talked to very plainly and very *prettily*. This spoils all; as it cannot fail of disgusting those to whom it is addressed, and of convincing them of the exceeding ignorance of their would-be instructors. An instance of what we mean may be found, among fifty others, in the Society's book on the Cholera, where the working man is informed, that many benevolent ladies employ themselves in making "*nice warm* stockings for the poor children." It is all in the same strain, but one such expression as this is sufficient to make the whole work contemptible. The instructions to a mechanic for seeing the British Museum, in an early number of the "Penny Magazine," are another precious sample. Such an article was a good thing in itself; but the sickening "be a good boy, and do as you're bid," style in which it was written, is absolutely nauseating. What with *such* original articles, and *such* selections, as we have noticed above, the "Penny Magazine" is truly a valuable compound. As to the engravings, they are very profusely given, but very coarsely executed, and often mere fresh impressions from cuts already used at least once in some of the Society's numerous publications. The editor is understood to be Mr. Chas. Knight, the bookseller, who, consequently, represents the whole Association in his single person; for it is believed, that the only real part the Society take in the matter is the lending of their name to force an extensive sale. We believe the scheme has succeeded, although not on the enormous scale the veracious advertisements on the cover would have us suppose.

The "Saturday Magazine" is a direct rival to the "Penny." When the Useful Knowledge Society was instituted, it was foreseen, that should it succeed to any extent, it would not want competitors—that if the *liberal* party in politics and literature should determine on wielding that powerful instrument, the instruction of the lower orders, their opponents would not tamely look on, without making an effort to wrest the weapon from their hands. In the Mechanic's Magazine, for instance, so long ago as March, 1827, it was distinctly observed, "A *counter-association will* to a certainty be formed, to prevent the predominance of this of Mr. Brougham's; and then we shall have two parties engaged in what each will call the diffusion of Useful Knowledge, but which will, in fact, be the diffusion of the peculiar opinions espoused by each." The former part of this prediction has, at any rate, proved singularly correct After regarding the progress of the liberal society with an envious eye for some time, the appearance of the "Penny Magazine" at length put the "adverse faction" on their mettle, and, at a meeting of the Society for the Promotion of Christian Knowledge—a Society, including the heads of the Church, and the leading members of the Tory party—it was resolved that no less a sum than (it is said) £20,000, should be devoted to the publication of *sound* popular treatises on the Arts and Sciences, and the immediate establishment of a weekly penny periodical. The "Saturday Magazine" is the result of this determination; in appearance, it is a *fac*-simile of its opponent; and, hitherto, there has not been much difference in the contents, except that the former is free from the paltry affectation noticed in its precursor. As yet, only broad religious principles, without reference to any particular tenets, have been enforced, so that the work bears no peculiar marks of its origin, and might, perhaps, be taken for a number of the Broughamite Society's publication, if its embellishments were not superior, and the whole getting-up much neater. It remains to be seen, whether the last part of the prediction referred to will come to pass, which is not unlikely, after the first commencement of the opposition race; in that case, the consequences must be highly pernicious, and the more so the wider the circulation of these publications may extend. We do not see what mighty good has yet been effected by them. Periodicals as cheap, or cheaper, had been produced before they appeared, by individual publishers. The harm they do is more apparent: they are already driving all works of a standard and substantial character from the market, and introducing a taste for mere flimsiness which must be productive of the worst consequences. They are also a great injury to the individuals concerned in publishing, who complain bitterly of having to compete, unaided, with a

Society, backed by large subscriptions, and supported by all the influence of government.

The "Guide to Knowledge" is a sort of compilation by Mr. Pinnock, the well-known editor of a series of elementary catechisms. It cannot be spoken of in any high terms of praise—the matter is all old, and quite destitute of arrangement, so as to form a mere incongruous mass. The "Guide," far from being, as he ought to, in advance, is far behind the spirit of the age. It might have been hailed as an acquisition fifty years ago, but—the case is altered.

The "Penny Cyclopedia" is a cheap synopsis of all knowledge; most dishonourably produced as if under the superintendence of the Useful Knowledge Society; a purpose to which its bills and advertisements were made subservient by a trick worthy only of spurious blacking-makers. It is pretty decently got up, and will, probably, last till the deception practised is universally discovered, or till the work, announced under the same title by the Society (and so announced *before this appeared*), shall burst upon the world.

A twopenny Cyclopædia, the "British," is also announced for the first of October, under very favourable auspices. Works of this kind, however, would take many years in completing, and it is not likely that the present fervour will last so long. *Verbum sat.*

The "Instructive Magazine" is only remarkable for the excellence of its cuts, representing the heads of animals, which are executed with admirable spirit and vigour.

The "Penny Novelist" and "Story Teller" are collections of tales. The "Casket" and "New Casket," are old-established works on a plan somewhat similar, but admitting more variety. But the most extensive speculation of all, is one just broached, "The Penny National Library," which consists, not of one work only, but of *eight*, all issued regularly at the same time. These comprise—a History of England, an Ancient History, a Law Library, a Standard Novelist, a Geography and Gazetteer, a Grammar and Geography, an Universal Biography, and an edition of Shakspeare! These are all neatly got up, but are destitute of the attraction of plates. The matter is *chiefly compiled from* the best writers on the various subjects; but with what degree of judgment, it is yet scarcely possible to judge. If they are all the production of one person, he must be a man of a thousand to be competent to the task.

"Chambers's Edinburgh Journal" (price three-halfpence) has obtained a considerable circulation. It has some merit, but a great deal more pretension. The prospectus is a most ludicrous production, from the intense conceit it displays.

There are cheaper publications even than any yet enumerated. The "Halfpenny Magazine" is issued from the Tatler office, but is very small in size ("as matters go"), and not very great in merit. The "True Halfpenny Magazine"—whose title, especially at first, when it was said to be published by "a Society for the Diffusion of Useful Knowledge," it is to be regretted, evinces something like deception—is superior to its rival both in quantity and quality; it gives sixteen quarto columns of very neatly printed letter-press, generally very entertaining, and often interesting, for "the small charge of one halfpenny." Truly, the force of cheapness can no farther go,—unless some enterprising publisher should venture on a farthing miscellany.

The "Halfpenny Library," now discontinued, was, perhaps, a superior work of the same class.

These are the most prominent of the cheap works with which the public are inundated; there are several others, especially some political ones of the worst description, which, however, now seem to be declining. If this sketch should prove acceptable, I may, perhaps, trouble the readers of the Mech. Mag. with a further account, and some considerations on the effects likely to be produced. The subject is one of too much interest and importance to be worthily discussed in a single short letter,—and

I am, Sir,
Yours, most truly,
F. H.

Sept. 7, 1832.

DR. LARDNER'S LECTURES ON THE STEAM ENGINE—FOURTH EDITION.

We gave a review of this work of Dr. Lardner's, on its first appearance, four years ago, and then expressed our regret that a gentleman of Dr. L.'s undoubted talents should have thought of trying to

make a subject "popular" and "familiar," of which it was manifest he had himself no practical or sufficient knowledge. His "Popular Lectures on the Steam Engine, in which its Construction and Operation are *familiarly* explained," struck us as being altogether one of the least "popular" and "familiar," and, we must add, one of the most superficial and inaccurate works on the subject we had ever read. It would seem, however, that we have had the misfortune to differ in this instance with the "most thinking public;" for we have now before us what bears to be a *fourth* edition of the book, of which we thought and spoke so lightly. We never, indeed, happen to have met with, or heard of any *second* or *third* edition; but that against the evidence of a title page, matters nothing —for title pages, as all the world knows, never, in particulars of this sort, state that which is untrue! A more suspicious circumstance is, that in this fourth edition, there is republished the "Preface to the *First* Edition," and no Preface to any *second* or *third*; but here again we feel bound to acknowledge, that it is only very vain authors who write prefaces to every new edition, and Dr. L. is notoriously one of the meekest and modestest of men! The fact, then, may be considered as past all *reasonable* dispute, that the work has, in spite of us and our dispraise, taken so prodigiously, that four editions of it—thumping ones, of course—have been called for in the same brief number of years! The circumstance which galls our critical pride most in this affair is, that the learned Doctor has never once stopped in the course of this galloping career, to change or to mend any one of those things, which we, in our great simplicity, thought put such galloping out of the question. First, there was *the steed*; it was entered for the race by the name of "Plain as a Pikestaff," out of "Talent," own sister to "Genius;" but we proved, by the Racing Calendars, that it was no other than that ancient mill-horse, "Blind as a Beetle," out of "Old Book-Stall," by "Compilation," own brother to "Trashery." Then there was *the rider*; he had neither girth to his saddle, nor stirrup to his foot, nor spur to *his heel, and, worst of all*, was mounted *with his face to old* "Blind of the Beetle's" *tail! Is it not* then enough to make *the gentlest of critics* crazy, to think, that so misaccoutred and mismounted a rider should, with so wretched a steed, win heat after heat against the best blood and bone in the country- succeed to admiration, where the Tredgolds and Fareys, and Galloways, and Milne's, could scarcely get beyond the distance-post—turning, in a word, the whole probabilities and possibilities of the case into utter derision? To speak more seriously —at all events, less figuratively—we must say, that, considering how much Dr. Lardner (according to his veritable title page) has been beholden to the favour of the public in regard to this book—how convenient were the opportunities which his second, third, and fourth editions afforded of correcting any errors into which he might (with the best of men and cleverest of authors) have fallen—and how much he ought to have been obliged to any one, who, in a fair and honest spirit, pointed out these errors to his attention—it does not say much for either his sense of justice or his sense of gratitude, that his second edition should be as faulty as his first, his third as his second, and his fourth as his third—that not one of the many errors of which he was convicted, has, to this moment, been corrected; but that the work appears now, after the lapse of four years, as exceptionable as ever. Were we to speak *still more seriously*, we should, perhaps, say, that we look upon the multiplicity of the editions as all fudge—that the Doctor has, in sober reality, had no opportunity of correction or emendation; that edition fourth is in all, except certain *additions*, the identical edition first; but that would be to vindicate the Doctor's sentiments of justice and gratitude, at the expence of his title page, which, for aught we know, might be proving Dr. Lardner to be at one and the same time, both a true man and a great pretender.

We have spoken of *certain additions* which have been made to the work. These consist of two Lectures (X. and XI.) on Railways and Steam-Carriages, and they are by far the best—certainly the only original—parts of it. If two passable chapters could redeem ten useless ones, they would give the work a fair chance of escaping the oblivion to which it is but too surely destined. Even here, however, Dr. L. has borrowed largely, without acknowledgement, and, in some instances, committed the most egregious

blunders. Of the latter, a couple of examples may suffice. He states, p. 165, that when "The Rocket" obtained the prize at the Liverpool and Manchester Railway Competition in 1829, the draught was accelerated by throwing the waste steam in a jet into the chimney; a contrivance which was not thought of *till a considerable time afterwards.* Again (page 172) he observes, that "the principle of draft in the Novelty, is totally distinct from this; in that the draft is produced by *a bellows* worked by the engine;" now, in the Novelty there was *no bellows*, and in the drawing and description which Dr L. himself gives of the Novelty (copied chiefly from the Mech. Mag.) there is nothing of the kind represented. Dr. L. appears to most advantage where he has nothing to do with machinery, but with such general matters as any common sense person can penetrate and understand. Adverting, for instance, to the double part which the Directors of the Liverpool and Manchester Railway have to play as proprietors of the railway and as carriers upon it, he very shrewdly observes:—

"In the act of incorporation granted to the Company, they were contemplated principally as a Company constructing a road for the accommodation of the public; and were authorised to charge certain tolls for carriages and burdens carried upon that road. They were, of course, at the same time invested with a certain discretionary power of refusing admission to carriages or engines on the road, if those carriages appeared likely to be injurious to it. The event, however, has presented the Company in another character, viz. of that of carriers on their own road; and instead of charging a toll to others running upon the road, they are themselves the exclusive monopolists as carriers as well as rail-road proprietors. I am not aware of persons applying to engage in the carrying traffic on the line having been refused permission by the Directors; but it may be easily imagined that the public will be discouraged from engaging in such competition when they are conscious that their competitors are also their judges, vested with the power of refusing them, at any moment, the permission to trade upon the road, under a plea, of the validity of which *the Directors themselves are the sole judges, their own engineer their sole guide, and from which the public have no appeal.* I should regret to be understood as preferring a charge, individually or *collectively, against the Directors* of this great national work, upon this or any other head; but it is undoubtedly adverse to the interests of the proprietors, that even the appearance of monopoly or jobbing should be presented to the public, in a work which forms a miracle of art in an age and country in which art has already effected so much. It cannot escape the notice of the most superficial observer, that in the manufacture of engines, and the other apparatus used upon the road, a singularly exclusive system has been pursued. This system is not less injurious to the ingenious persons themselves who are employed by the Directors, than it is to the Company and the public; and it may be hoped that the unequivocal manifestation of public opinion upon the subject, which has been already made, will have the effect of removing, or mitigating this evil. It is not the least evil attending such a state of things, that the genius and enterprise of the country, as far as they may bear upon the improvement of the powers of the undertaking, are paralysed by the distrust, whether well or ill-founded, which such a system naturally produces. Those who are skilled to project improvements, feel a natural and excusable jealousy, that their proposals will be submitted to the decision of persons, who, being competitors in the same race of improvements, are interested in rejecting them; and, however pure the motives, and just the judgments, of such arbiters may be, their decisions will never be sanctioned by public confidence. It would, therefore, be wise in the directors of all such bodies, rigorously to exclude from their councils all persons whatever, who, directly or indirectly, receive any advantage from the commerce or manufacture in those objects, the merits of which may be under consideration. Jobbing (the bane of British enterprise) should not only be excluded in reality, but should be banished even in appearance."

The Doctor makes another "palpable hit," in reference to the *Newcastle burr*, which, through favour of the clan Stephenson, is so predominent along the whole line of the railway.

"I cannot conclude my observations on this great national undertaking, without expressing my regret that the directors have not thrown its advantages more open to the population among whom it has sprung up. No visiter can examine the details of the works without being struck with the circumstance, that the bulk of the persons engaged upon them,*

* The number of persons employed exceed 700.

in almost every capacity, are strangers to the soil, and to the surrounding population, and appear to be brought from another part of the kingdom, to reap the benefits to which the local population have a moral right—a right which I am persuaded the body of directors and proprietors would, if consulted individually, have respected."

However, we suspect it would take many more such fresh passages as these, or than Dr. L.'s two new chapters can boast of, to bear up the work against the depressing influence of the "stale and unprofitable" stuff of which the bulk of it is made up. We think the best thing the Doctor could do—providing always, that solid and lasting renown, is the object of his ambition, and not mere puffing and pence—would be this: either to write the whole work over again, or, with all convenient speed, to withdraw it from circulation altogether.

LIFE RAFTS—AN ADVENTURE.

Sir, With great pleasure I read in your last No. the account of "Canning's Life Raft," which reminds me of my first invention when on board the Bedford, 74. It was a raft for individual escape; and, after the seige of New Orleans, when the bottom was beat out of our launch, in a gale of wind, when the stoutest men and best swimmers were afraid to venture to reach the shore, I volunteered, and successfully gained the land, distant about four hundred yards, with the open sea on my larboard side. Ned Moore, the captain's joiner (a hearty fellow, who afterwards saw many banyan-days) was the maker. Now for the description.

It was a waterproof oblong square, two feet long, from the centre of which was formed an equilateral triangle. It was a foot high; and in the centre of the top was a circular hole, six inches in diameter. In this was placed a wooden bung, resembling a main hatchway; and at the square end I had a rudder, with the tiller pointing aft. At each corner of the bottom, and at the angular point I fixed a brass ring, $\frac{1}{4}$ inch in diameter, that turned on a small swivel, in each side of which swivel were screw-holes. Through the rings at the sides of the bottom I rove two pieces of whip cord, and spliced one piece into the ring at the end. In a piece of wood, 14 inches long and 9 broad, the middle of which terminated in an angle, I spliced the five ends of my cords. Eleven inches from the square end, in the bottom, I fixed two rings, $\frac{1}{16}$ inch inside diameter. Through these I passed the axes, 3 feet long, 1 foot of which in the centre was turned in the lathe; the two ends were squares, cut in two by a fine saw, $11\frac{9}{16}$ths inch. Through these cuts I passed a sheet of block tin, which was strengthened by two strips of iron, soldered on the edges of the tin. At the right hand axis I had a handle.

On one occasion, when all hands were piped to swim, I directed my messmate to lower my raft from the foremost lower deck-port. He did so; and, seated on my platform, I made from my comrades, right a-beam, at the rate of six knots an hour. Captain Walker was on the poop, and cried out, "Hang that fellow, he'll be drowned; send a boat after him." The jollyboat pulled after me, and when it was within a hundred yards of me, I put about, steered for the port, where my messmate took in my raft, and hung it up between the carlines. Some of the boats crew often related the adventure to me, declaring, "they thought it was the d....l they were pursuing, for he did not swim, and yet he went through the water like a dolphin!" My head and shoulders only were out of the water; I steered with my mouth; and my raft would hold 14 lbs. of provisions, besides carrying myself; but its construction cost me 32 pints of grog = 32s. I could now, for the fifth part of this, construct a raft for one person that would fit in a foot square, and always be ready in a few seconds when a ship or boat went down.

An Indian rubber ball, 9 inches in diameter, would be sufficient to keep the heaviest man's head above water, as long as strength remained. It could be rigged with tapes in five minutes, and a board, 14 inches by 9, would complete this raft. If posts were placed along canals and rivers, at every hundred yards distance, the expence of these life-preservers, posts and all, would not average more than 3d. yearly each in a century.

I remain, Sir,
Your obedient servant,
M. Rough, Schoolmaster.

21, Little Earl-street, Seven Dials,
Sept. 10, 1832.

N. B.—The Indian rubber balls were

alighted by a young gentleman in the Mechanics' Magazine office. I never once thought of them until he directed my attention to them. I think that the [illegible] valuable, and, if I should get the means of exemplifying my plan, I will [illegible] put his in practice, and he shall have the entire merit of it. In St. Owen's Bay, Jersey, in 1803, when a boy of the 51st was drowned, I ventured out to sea on a pyramid of wood, but I was near being lost. I was an hour and 37 minutes in the water. One Hurly saved my life; I was then servant to Captain, now Colonel Rice.

M. R.

REPORT OF THE COMMITTEE OF THE FRANKLIN INSTITUTE OF PENNSYLVANIA, APPOINTED MAY, 1829, TO ASCERTAIN, BY EXPERIMENT, THE VALUE OF WATER AS A MOVING POWER.

(Continued from last Number, page 381.)

The amount of friction due to the constant weight having been thus found, we proceed to the numbers which varied with the weights added in the experiments, and with the points of admission of water to the wheel.

CHUTE No. 1. (Fig. 1.)

The centre of gravity of the water in the buckets of the wheel when supplied by this aperture, was 6.207 feet from the axis, and the barrel about which the chain was wound, was 1 foot from the same axis; hence, to raise 257 lbs. the constant resisting weight, and overcome a friction of 43.81 lbs. the constant friction just found, required a weight of water of . . . . . 48.46 lbs.

The friction due to this weight, is		0.73 lbs.
Constant friction derived above		43.81 ,,
Whole amount of friction overcome in raising the constant weight of 257 lbs.		44.54 lbs.

To find the additional friction due to each of the bars of lead which were used as weights, we have—

Weight of the bar	103.00 lbs.	
To balance this weight and the friction due to it (103 lbs. + 1.54 lbs.) or 104.54 lbs. required, at 6.207 feet from the axis, a weight of water of	16.84 ,,	
Total	119.84 lbs.	
Friction for each bar of lead, being that upon the weight just found at one and a half per cent.		1.80 lbs.

CHUTE No. 2. (Fig. 1.)

In this case the centre of gravity of the water in the buckets, was 7.01 feet from the axis, to raise 257 lbs. and overcome the friction of 43.81 lbs. required . . . . . 42.91 lbs.

Friction due to this		0.64 lbs.
Constant friction as above		43.81 lbs.
Total friction due to constant weights		44.45 lbs.

For each additional bar of lead—

Weight of the lead	103.00 lbs.	
To balance this weight and the friction due to it . . .	14.91 ,,	
Total	117.91 lbs.	
Friction for each bar of lead		1.77 lbs.

CHUTE No. 3. (Fig. 1.)

The centre of gravity of the load was in this case 6.58 feet from the axis; to raise 257 lbs. and overcome a friction of 43.81 lbs. required . . . . . 44.72 lbs.

Friction due to this		0.68 lbs.
Add as before		43.81 ,,
Total friction due to constant weight		44.49 lbs.

For each bar of lead which was added—		
Weight of the lead	103.00 lbs.	
To balance this weight and its friction	15.88 ,,	
Total	118.88 lbs.	
Friction due to each bar		178 lbs.

CHUTE No. 4. (Fig. 1.)

The centre of gravity of the load was 5.59 feet from the axis; to raise 257 lbs. and overcome the friction of 43.81 lbs. required	51.07 lbs.	
Friction due to this		0.76 lbs.
Add as before		43.81 ,,
Total friction due to constant weights		44.57 lbs.
For each bar of lead added—		
Weight of the lead	103.00 lbs.	
To balance this weight and its friction	17.74 ,,	
Total	120.74 lbs.	
Friction due to each bar		181 lbs.

CHUTE No. 5. (Fig. 1.)

The centre of gravity of the load, was 4.54 feet from the axis; to raise 257 lbs. and overcome a friction of 43.81 lbs. required	62.15 lbs.	
Friction due to this		0.93 lbs.
Add as before		43.81 lbs.
Total friction due to constant weights		44.74 lbs.
For each bar of lead added—		
Weight of the lead	103.00 lbs.	
To balance this weight, and its friction, required	21.59 ,,	
Total	124.59 lbs.	
Friction due to each bar		1.87 lbs.

The water delivered through Chutes Nos. 5 and 6, acts principally by impulse, at nearly the extremity of the radius of the wheel; this remark applies to No. 5, more exactly, when the head of water above the aperture is considerable; for all heads above four feet, the centre of force was taken at nine feet from the axis.

Not only is the arm of the lever, upon which the water from apertures Nos. 5 and 6 acts, greater, but the direction of the impulse does not coincide with that of gravity, hence the amount of pressure is not the same with the weight, or the ratio of friction to the weight must be diminished. The friction for Chute No. 6, and for Chute No. 5, when the head is more than four feet, may be taken at three-fourths per cent. of the weight. The amount of friction being but small, nice calculations upon these points would have been entirely useless.

CHUTE No. 5.—When the head is above four feet.

To raise 257lbs. and overcome a friction of 43.81lbs. requires a weight of water, at 9 feet from the axis, of	33.42lbs.	
Friction upon this at three-fourths per cent		0.25 lbs.
Add as before		43.81 ,,
Total friction due to constant weights		44.06 lbs.
For each additional bar of lead,—		
Weight of bar 103lbs. friction at one and a half per cent.		1.54 lbs.
To balance this weight and its friction, required	11.62 lbs.	
Friction upon this at three-fourths per cent.		.09 ,,
Friction due to each bar		1.63 lbs.

CHUTE No. 6. (Fig. 1.)

The friction was sensibly the same with that for Chute No. 5, when the head at that chute was above four feet. Hence the friction due to the constant weights was . . . . . 44.06 lbs.
And the friction for each bar of lead . . . . . 1.63 lbs.

CHUTE No. 7.—Undershot.—(Fig. 1.)

Here the water acting entirely by impulse, the centre of force may be assumed at 9.75 feet from the axis.

To raise 257 lbs. and overcome a friction of 43.81 lbs. required, at 9.75 feet from the axis, a weight of . . . . . 30.85 lbs.
Friction upon this at three-fourths per cent. . . . . 0.23 lbs.
Add as before . . . . . 43.81 lbs.

Total friction due to constant weights . . . . . 44 04 lbs.

For each bar of lead added,—
Weight of bar 103 lbs. Friction upon this at one and a half per cent. . . . . 1.54 lbs.
To balance this weight and its friction, required . . . . . 10.72 lbs.
Friction upon this at three-fourths per cent. . . . . 0.08 ,,

Friction due to each bar . . . . . 1.62 lbs

The foregoing calculations were applicable until nine leads, (927 lbs.) had been added to the constant weight in the basket; this weight suspended the end, o, (fig. 3) of the shaft of the wheel. Any addition of weight to this, pressed the gudgeon against its cap with a force which was to the tension of the chain produced by the weight added, as the distance from the point at which the chain acted to the other gudgeon, (o', fig. 3) was to the whole length of the shaft. The whole length of the shaft was 9.25 feet, the point of suspension 1.66 feet from the end o, of course 7.59 feet from o'. If one lead of 103 lbs. be added to the nine supposed in the basket, the force drawing the shaft upwards will be 103 lbs. together with its friction 1.54 lbs. or 104.54 lbs.; to find its effect upon the gudgeon, o, we have the proportion, 9.25 : 104.54 :: 7.59 : 85.78, the force, in pounds, with which the gudgeon, o, is pressed against its cap. Subtracting this weight from 104.54 lbs. the total weight from which both the gudgeons are relieved, there remains 18.76 lbs. the force tending to draw the gudgeon o' upwards, or the weight from which that gudgeon was relieved.

To ascertain the friction when more than nine leads were added to the constant weight in the basket, we have,

Friction due to the weight of each lead of 103 lbs. . . . . 1.54 lbs.
Tension of chain between axis of wheel and drum pressing upon the gudgeons of the drum . . . . . 104.54 lbs.
Force with which gudgeon o was pressed against its cap 85.78 lbs.
From this deduct the weight from which the gudgeon o' was relieved . . . . . 18.76 ,,

There remains the pressure upon the axis of the wheel . . . 67.02 lbs.

Total pressure upon the gudgeons of the wheel and drum, by the addition of each lead after the ninth . . . . . 171.56 lbs.
Friction upon this at one and a half per cent. . . . . 2.57 lbs.

Friction due to each lead after the ninth, exclusive of the water required to overcome this friction . . . . . 4.11 lbs.

When the water was admitted to the wheel through CHUTE No. 1.
To overcome 103 lbs. and the friction of 4.11 lbs. or 107.11 lbs. required, at 6.207 feet from the axis . . . . . 17.26 lbs.
Friction due to this . . . . . 0.26 lbs.
Friction just determined . . . . . 4.11 lbs.

Total friction for each lead after the ninth . . . . . 4.37 lbs.

The friction due to the weight of water necessary to balance each additional load and its friction, was so small that its variations when the water was applied through the different chutes, could with propriety be neglected. The variation from the friction given by Chute No. 1, in an extreme case, that of Chute No. 5, at a friction of one and a half per cent. is but .07 of a pound. The friction for each load after the ninth, was, therefore, taken at 4.37 lbs. at all the chutes.

(To be continued.)

RAILWAYS AND CANALS.

Sir,—A review, in the August Part of the *Athenæum*, of *Grahame's Letter to Wood, on Railroads versus Canals*, seemed to me to contain so many curious assertions, that I turned to the letter itself. I soon found that the *Athenæum* reviewer must have been practically unacquainted with the subject, or he would not have permitted such a mass of errors, as these pages contain, to pass unchastised. But an incompetent reviewer ought not to have handled a question of so great national importance as the relative merits of railways and canals. The whole letter reviewed is most unfairly and unscientifically written; and I wish, through your useful journal, to point out a few of the most glaring misrepresentations it contains. It would be very tedious to go minutely through all the false statements which are found in it. However, after the exposure I shall make, surely none of your readers can be misled by these forty pages of blunders. To support my charges, I refer to the accounts and reports published by the Liverpool and Manchester Railway Company, and to the statements of performances *seen* by Dr. Lardner, given in his excellent work on the steam-engine; and I shall make no assertion unsupported by these authorities. It will be seen, that our author can only be exculpated of wilfully perverting facts, by admitting him to have drawn from the most inaccurate instead of the best sources of information in his power.

1. His statement (note p. 10) that the comparative cheapness of horses, locomotive-engines, and fixed engines, as moving powers, is yet uncertain, will appear, from what follows, to be totally erroneous.

2. He states the consumption of coke of a locomotive-engine at 2½lbs. per ton per mile (p. 12); whereas he ought to have learned, that in the improved *engines, with full loads*, it is from ¼ to ½ lb. *per mile per ton. Indeed, all* his calculations *have been* based upon the performances at the opening of the road, *whilst he knew* (see p. 34) *how far these were exceeded by the improved engines!*

3. In further reasoning (p. 13) on the expense of motive-power, our author *increases* this consumption of coke (when really he hardly could be ignorant he had already made it *ten times* more than reality), and estimates the cost of *coke, for firing alone*, at within a fraction of what the *printed* report of the Company showed him was the expense of wear, tear, and repair of engines, wages of engineers, and attendants, coke for firing, and ALL charges for moving-power per ton per mile!

4. In reply to his note (page 14) about the *power* of a horse, drawing on a canal at three miles an hour, exceeding a railway engine, we give our author this FACT:—*No horse* can draw at three miles an hour on any canal, *one half*, or *one third* of the load. Dr. Lardner saw the Sampson move at *twelve* miles an hour, viz. 223 tons, 10 cwt.

5. All the statements (in page 18) about the powers of locomotive engines, in conveying passengers, form an unmixed tissue of errors. It is wholly false that 120 passengers, added to a train of 120 passengers, or 240 passengers in all, would stop the speed of fifteen miles an hour, as effectually as a train of warehouses. On the very contrary, more than *three* times 240 passengers have been drawn by one engine, in one trip, at that speed, and twice 240, frequently.

6. It is really unpardonable for our author to say (page 21) that Mr. Wood's statements of the performances of locomotive engines can, in his opinion, never be accomplished. He could not be ignorant that they have been far exceeded in accomplishment.

7. All the assertions (in pages 25, 26, and 27) particularly as to *four* lines of way in place of two, are purely unsupported assumptions, directly opposed to fact and experience.

8. All our author's calculations (page

30 and 31) are founded on results obtained *before* locomotive engines had been practically tried, and are void of all accuracy. And, at the very moment whilst he was thus drawing conclusions from the capabilities of the *first trial* engines, he was aware of the performances of the Planet and the Sampson! (see p. 34).

It is needless to add comments to these facts, or to go farther in my ungrateful duty of exposure. After the errors I have noticed, surely no man who reads the Mechanics' Magazine, in England or abroad, can put faith in a single page of "Grahame's Letter to Wood, on Canals and Railroads."

Your very obedient servant,

QUIVIS.

Liverpool, Sept. 6, 1832.

ON THE RECTIFICATION OF SPIRITS OF WINE, AND TAKING ITS SPECIFIC GRAVITY WITH HOUSEHOLD UTENSILS.

Sir,—I have often heard mechanics complain that they could not procure any spirits of wine that would make good lacquer, and that they had no means of ascertaining its strength. If they look at the article "Specific Gravity" in an Encyclopædia, they get into a labyrinth of hydrostatic balances, hydrometers, &c. If they use the hydrometer, they must have at least half a pint of spirit, which is often more than they want; neither would it give them the desired information: for, according to the tables, proof spirit is half water and half spirit; but rectified spirits of wine is 60 per cent. over proof! What a great pity it is that this instrument was not originally graduated to the simple specific gravities. It would then have answered all the purposes of a saccharometer; and if made of glass or platina, it would have given the specific gravities of all the acids and saline solutions, and would have been generally used long before this time. As hydrometers are now constructed, they cannot even be compared with one another; for the old ones are now rendered useless by the introduction of Sikes' into the excise. It is the same with the saccharometer, for what is 26 lb. per bar by Richardson's, is only 62 lb. per bar by that of Dicas!

It may be useful, under these circumstances, to lay before your readers the following method of taking specific gravities with the aid of such common household utensils as are accessible to every one.

Take three ounces of rectified spirits of wine, and one ounce* of salt of tartar; heat the salt red hot in an iron ladle, for about a quarter of an hour, and beat it into a powder with a pestle, or the round end of a poker, and add it warm to the spirits; let it stand a few hours, shaking it occasionally; then decant it into a dry green glass draught phial; fix a bent glass or tin tube into it with a little cotton, and let the other end fit loosely into the dried phial, in which the lacquer is to be made. Place a warming-pot half full of water on a common fire, put the green glass phial into it, and the other into a vessel of cold water, and distil till about 2 ounces have come over.†

Lacquer should be made of absolute alcohol; I doubt whether it could be rectified sufficiently for this purpose; perhaps it might, if the lac and the colouring materials were well dried for an hour at 212° Fahrenheit; but this I have not tried. Now, as the specific gravity of a fluid is merely the weight of a measure of it, take a small phial (or a glass tube would be lighter and more easily cleaned and dried) about half an inch wide and three and a half inches long; twist a small wire round the neck, so that it will swing in the common money scales; then weigh 100 grains of distilled water (rain water caught in a dish, or drained from the cover of a clear boiler would do) cooled to the temperature of the water in the well, and make a mark with a file level with the surface.

Then dry the phial, and fill it to the mark with the spirit to be tried, cooled to the same temperature, and the weight in grains will give the specific gravity at one operation. A measure which I subjected to the above process, weighs 79 grains, which, by adding an 0=·790, is the very specific gravity of pure alcohol to the second place of decimals, and the third place is something like the frac-

* The salt will do for any number of times; fresh burnt powdered lime will also do if it stands a day or two, and would, most likely, answer without rectifying. The quantity of salt will depend upon the purity of the spirit; pure spirit will require less than impure.

† It may then be applied to cold utensils without chilling.

tional part of a farthing in arithmetic—it is a dead letter. Such hair breadth niceties not being required in practical affairs, ·800 may be stated to be the specific gravity of alcohol in round numbers, at 60° Fahrenheit—distilled water being ·1000; so that there is a difference of $\frac{1}{5}$, which is equal to 200 ounces in a cubic foot; consequently, it was as easy to take the gravity of a sample of spirits, as it is to find the value of a light guinea.

When lacquer has been made with a weak spirit, which may be known by its easily chilling and rubbing off, the spirit may be recovered by distilling to dryness, and probably the lac, &c. would do again; but this remains to be tried. The bottle should not, however, be more than a third full. The specific gravity of the spirits of the shops, is from ·830 to ·850. By this simple means the specific gravity of all fluids, from sulphuric acid to ether, may be taken. It will answer the purpose of a hydrometer, saccharometer, and lactometer, as well as for taking the specific gravity of corrosive acids.

It would also be useful to tanners, dyers, and all persons who have any thing to dissolve, and that they wish to know the weight, and, consequently, the value of.

I beg to remain,
Your obedient servant,
G. Dakin.

Dereham, Norfolk, Aug. 13, 1832.

ARCHITECTURAL QUACKERY.

Sir,—In all ages, and among all professions, we find a certain degree of unmeaning *cant*, gradually evincing itself with the progressive enlightenment of society, and passing current under the mask of philanthropy. If Britain is the most enlightened country in Europe, as is generally asserted, we may safely add, that she can also boast of the greatest number of heartless impostors; and, when we find the hypocrisy of Divinity, the quackery of Physic, and the cabalistic phrases of Law, setting an example to the consequential tradesman, the ambitious mechanic, and the conceited labourer—we cannot be surprised that Architecture has not escaped the notice of those who are calculated more to degrade than to exalt her.

It is amusing to read some of the articles transmitted to different periodicals on the subject of architecture, and on the state of the "labouring poor." I presume you are engaged with "metal more attractive," and therefore have not had time to spare over them; otherwise, you surely would not have allowed such weak, impracticable things to pass without a *lashing*.

Sometimes we have the "lover of the picturesque," describing all the beauties of rural scenery, in a most pathetic and sentimental strain, fancying himself at once a poet and a painter, nay, a philosopher! His "cottage homes" are perfect heavens; and we find that "mellow tints—pigstyes or thatched roofs—bird-cages—hills and dales—glens and valleys—poultry, rats, and bee-hives"—are with him words that "come skelping rank and file" at each other's heels, without rhyme or reason; and although his recommendations are perfectly impracticable, agreeable to the present or to any other state of things, yet he offers his unqualified opinions with the confidence of one who has a profound knowledge of political economy! His rhapsodies are generally prefaced by the powerful plea of a desire for "bettering the condition of the poor"—which may be the case; but on this point I am frequently rather sceptical, and ready to question whether it is so much for this purpose, as it is to gratify his vanity: excuse him, then,

"'Tis pleasant to see one's name in print."

Next we have plans, &c., with various instructions for the erection of labourers' cottages and other buildings, furnished us by some amateur architect, who intrudes upon our notice something amazingly grand; but which shows him to be at least a century behind in his ideas. With a few technical terms, which he has by rote, like his horn-book, and a due observance of the words, "characteristic simplicity" and "economy"—he fancies he is quite an architect, and competent to treat on any part of the subject; but without any further claims to that title, than the mere possession of a handsome case of mathematical-instruments, as well as a Spanish mahogany drawing-square with a shifting-head (the latter convenience, however, he considers must be a mistake of the maker, as he sees no use that it can be applied to), be-

sides a sector and protracting-scales, which he could easily dispense with, as he only makes use of the former as a foot-rule. In the designs of such an architect we must not be surprised to find disproportioned doors and windows, with their lintels on different levels; impracticable stair-cases; doors of the chamber-story exactly in situations where the flues of the lower chimneys must be; and, in many cases, the walls of the chamber-plan produced, without any provision being made for the flues of the ground-plan. In the elevations we may perceive a combination of forms that would baffle the most persevering individual to trace their origin. Such a would-be-architect, however, represents himself to be a warm friend to architecture!

Again, we have the *critic*, who, without any deference to the opinions of others, passes *unqualified judgment* on every thing before him. The great evil with him is, that he has to give his opinion on subjects that he does not, nor cannot be expected to, understand; and, therefore, it is with him as with the astrologer's apprentice—frost or thaw, good or bad, agreeable to fancy, or his humour at the moment. Like the sovereigns of the East, he assumes a high and mighty style—"sovereign of all the sovereigns of the earth"—critic of all the critics of London. He sees no beauty in St. Paul's; the new Post Office, in his opinion, is a heavy mass of building; and Somerset House has a thousand faults, "which may easily be perceived without the necessity of pointing them out!" We find him lavishing unbounded praise on some architect for having exhibited so much taste in the design of a certain building, and attributing unlimited blame to another architect for the very bad taste displayed in some other structure; while the former is, perhaps, a mere copy from an original in Attica, and the latter an exact model of a building in Rome. Indeed, he is fully convinced that architecture is very much on the decline. Thus Science

> "——— laughs at foes like him,
> And dreads a friend like t'other.

It is a singular thing, that although the most simple business in mechanics requires five or six years study and practice before a person can be said to be fully master of his trade; yet, architecture, than which no profession requires more learning, study, and judgment, is attempted by so many individuals, who consider themselves quite competent if they can merely use drawing-instruments.

It would be well for those who profess to have so much philanthropy, if they would exert themselves more fully in their own particular calling, and thereby "better the condition of the poor," and become more useful to society. We all possess a talent for something or other; and the only way to benefit our fellow-men (which ought always to be our highest aim), is to exert ourselves in the attainment of greater proficiency in the particular calling which we have the greatest knowledge of, or which we find most suitable to our capacity. The desire of attempting new things and subjects beyond our province, although perfectly natural to man, ought to be strictly guarded against, as the evil is twofold—viz. the cause which we aspire to benefit is hurt by our interference, and the cause in which we might have been useful is neglected. Indeed, the most striking characteristics of man are the extensiveness of his powers of imitation; and as the progress of society brings with it talent and original ideas, those pretenders will, of course, increase in proportion to the numerical increase of the facilities out of which their derivative acquirements and surreptitious fame have to be fabricated. To guard strictly against this evil should be the office of legitimate criticism. However, I trust that the growing thirst for knowledge will induce individuals to look with a jealous eye upon those canting pretenders; and put to the blush the *mere* compass-and-square "architects," who arrogate this title without the necessary qualifications. And now, Mr. Editor, from being conscious of my own weakness, I beg to withdraw (perhaps you would have granted me this sooner), lest I should come under the censure that I have been lavishing on others.

I remain, Sir,
Your obedient servant,
R.

Bayswater, Sept. 3, 1832.

P. S. In the last communication of mine which you did me the honour of inserting, p. 359, 1st col. 2d line, for "cause," read "case."

Invariable Pendulum.—M. Mitscherlich has found by experiments that heat expands a rhomb of calcareous spar in the direction of its axis, and contracts it in directions at right angles to that axis. Sir David Brewster deduces from this fact the following interesting conclusion:—"As there must be in any given length of massive carbonate of lime as many expanding as there are contracting axes, then if the contractions and expansions in each individual crystal are equal, they will destroy one another; but if they are proportionate to their lengths the contractions will exceed the dilatations. In this case we have only to combine the marble with an ordinary expanding substance to have an invariable pendulum. The balances of chronometers might be thus made of mineral bodies."

The Turning-Lathe.—Sir, In No. 460, Mr. Walker, of Hackney, gives a plan for inspecting the work in the turner's lathe without stopping it: and asks whether any of your correspondents have seen similar arrangements? I beg to inform him, the plan he proposes has been for many years in use; and I have seen it at work in the screw-engines both at Tavistock and Birmingham. At Portsmouth and Woolwich arsenals they have a similar plan, shifting (by means of a lever) the band from the pulley which is *fixed* on the mandril to one that is *loose* on it, by which the tread-wheel and band continue their motion while the work is examined. Thinking this simple and cheap method of obtaining his end may answer the object of Mr. Walker's inquiries, I am, your obedient servant, T. D. L.

Railroads and Conveyance of Cattle.—Country-killed meat will keep from thirty to forty hours longer than meat slaughtered in London; and it is allowed by the trade that many thousand pounds per annum—I think I may say two or three hundred thousand pounds—would be saved to the public and to owners, graziers, &c., if it were possible to get the beasts to market without the deterioration resulting from the driving and shameful irritation they are now subject to from dogs and drovers. One of the most eminent physicians of the day told me that he considered one-half the fevers and disorders of the inhabitants of London originated from the continued use of London-killed meat, rendered unwholesome from the state in which the animals are usually slaughtered. I look to railroads as a certain antidote to this long-continued and increasing evil; when laid down, the interest of the country butchers and graziers will be promoted by the cheapness and expedition of the conveyance, and London will have the important advantage of being supplied with meat from the country meadows, killed in a cool and healthy state, and sold at a much lower price than meat of the present unwholesome description can be obtained at, more especially at the west end of the town.—*Mr. S. Munday, meat-salesman, to the Secretary of the London and Southampton Railway—Voice of Humanity, No. 9.*

Medical Police.—Our future annalists will doubtless record it as an historical fact, not less singular than true, that in the 19th century of refinement and civilization, at a period, too, when an appalling and inscrutable pestilence, which "walketh in darkness" and ravages the metropolis and the greater part of the kingdom—retrograding, in this respect, from the ages of Henry III. and Henry VII.—those "abodes of *cruelty, filth*, and *pestilence*," the *slaughter-houses* and *knackers' houses* existing in the midst of our densely-populated districts, still remained neither *unreformed* nor *unremoved*—that during a time, too, of prevalent sickness, the *wholesomeness* of the animal food exposed for sale was not subjected to any inspection, but that the PUBLIC HEALTH was left wholly unprotected.—*Voice of Humanity.*

Blackfriars' Bridge.—A Special Committee has been appointed by the Corporation of London to inquire into the state of Blackfriars' Bridge, which has been for a long time in a very dilapidated condition. It is rather extraordinary that, notwithstanding the numerous reports circulated relative to the bridge, no survey has taken place since the year 1820, although at that period it was reported to the Corporation that it was in a dangerous state.

Extraordinary Subterranean Fire.—The great heat which has prevailed, almost without interruption, for nine weeks, has produced a phenomenon in the countries bordering the lake of Geneva, to which there is no parallel on record. All at once the alarm bell of the village of Magland, in Savoy, summoned the inhabitants to extinguish a fire of a kind hitherto unheard of; for it was not houses, or trees, or heath that was burning, but the roots of the trees two feet under the ground. Nothing appeared on the surface, the furze and bushes were untouched, till at once several trees fell, and were then consumed by the fire that proceeded from the roots. Altogether 250 acres of fine forest were consumed. This subterranean fire is doubtless closely connected with flames which at the same time issued from the earth in several places in Lausanne.—*Algemeine Zeitung*, Sept. 4.

Progress of Steam Navigation.—In 1817 and 1818, the steam boats between New Orleans and Louisville generally occupied from 25 to 30 days in the passage, but now they perform the same voyage in 9 or 12 days, having thus increased their power more than 50 per cent.—*American Journal.*

Working Bees.—In a late No. of the Transactions of the Linnæan Society of Bourdeaux, a M. Espaignes affirms, that he has ascertained that the working bees are all of one sex—the male. If this be true, we shall have to look on these wonderful creatures, as miracles of civilization as well as industry.

Outside Show and Inside Comfort.—Putting a servant into a handsome Gothic cottage is like putting him into a handsome suit of livery: but there is, unfortunately, for the servant this difference, that the faults of the dwelling, if it does not fit, cannot be so readily perceived as those of the coat; and nobody may know but the occupant and his family how little comfort sometimes exists under a gay exterior. For our own part, we have seen so many ornamental cottages and lodges on gentlemen's estates, both in England and Scotland, small, damp, and badly contrived within, that we are compelled to consider them as much badges of slavery as a suit of livery. Let us hope that another generation will effectually simplify and improve the former, and entirely abolish the latter.—*Mr. Loudon: Encyclopædia of Cottage, Farm, and Villa Architecture, Part IV.*

INTERIM NOTICES.

Mr. Audubon's friend shall have the hearing to which he is entitled in our next.

Communications received from E. S. L.—E. H.—An Engineer—Enquirer—Mr. Saul—Mr. Ashley—Mr. G. R. Booth—Saxula—C. D. S.—Mr. Young.

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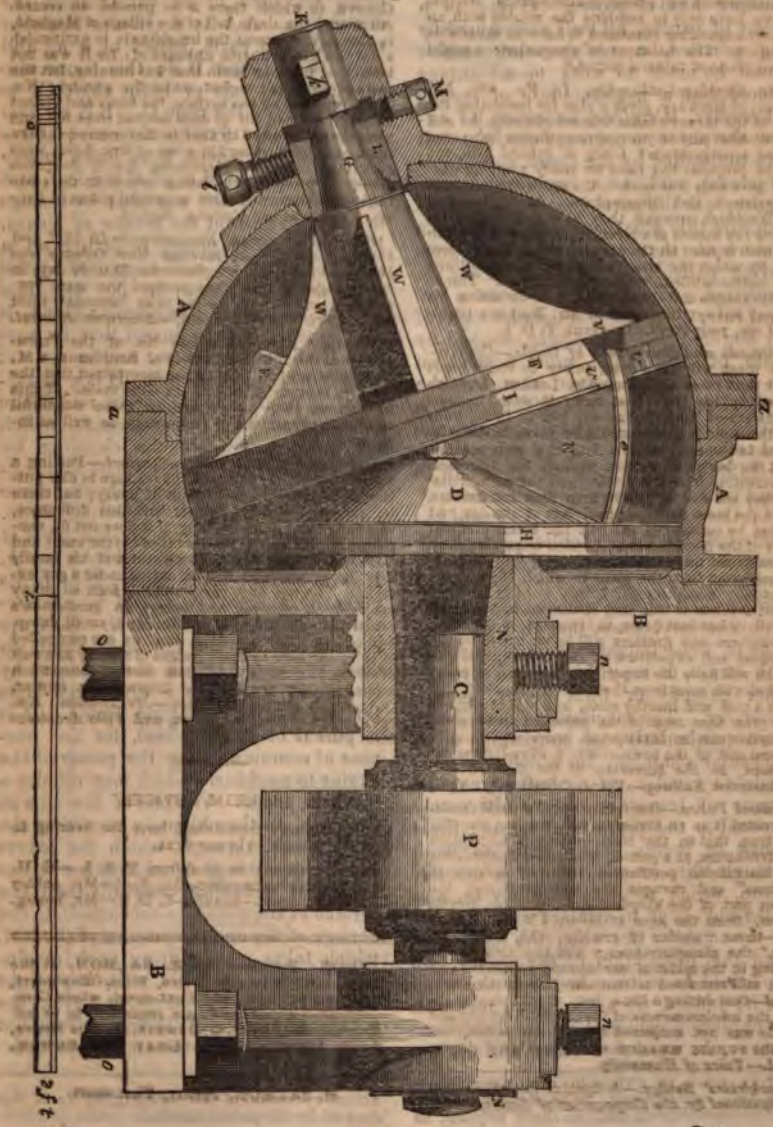
ERICSSON'S STEAM ENGINE AND WATER MILL.

Fig. 1.



ERICSSON'S STEAM-ENGINE AND WATER-MILL.

Perhaps the most interesting problem in mechanical science is, how to simplify the steam-engine, so that its bulk and weight, which are at present somewhat enormous, may be reduced within more convenient limits without any corresponding loss of power. Owing to a variety of causes, all well ascertained by long practice, a reciprocating engine cannot be made to work to advantage at more than a moderate rate of speed; it becomes, therefore, necessary to expose the piston to a great force, (for that force multiplied by the speed, constitutes the power), and, as a necessary consequence, all the parts that have to communicate this great force, as well as the frame-work that carries those various moving parts, must be made strong in proportion. Hence it follows as a general rule, that the bulk and weight of any engine of a given power, worked by steam of given force, must depend on the speed of the piston, that is, the speed of that surface which the steam is made to propel. This truth forms the basis of the construction of the very remarkable engine which we have now to bring under the notice of our readers.

In the patent which Mr. Ericsson has taken out for this invention, he designates it as "an improved engine for communicating power for mechanical purposes;" and this generality was, perhaps necessary, since, though it promises to be of most importance in connection with steam, it may be worked by any other gaseous or fluid power, as air, water, &c. The specification describes it more particularly, as consisting of a "circular chamber, in which a cone is made to revolve on a shaft or axis by means of leaves or wings, alternately exposed to the pressure of steam; these wings or leaves being made to work through slits or openings of a circular plane, which revolves obliquely to, and is thereby kept in contact with the side of the cone." But when the reader has read this description of the engine, we are afraid he will not be much the wiser for it; indeed we never before met with an engine of which it was so difficult to convey, *in words*,* a clear and distinct notion, and which was at the same time so little complex in its construction. We shall, therefore, be obliged to depend more than usual on the assistance of our engraver, to make the following description plain to our readers.

Fig. 1 represents a longitudinal section of the engine, the circular chamber being supposed to be cut through the centre-line. A A is a circular chamber made in two parts, joined at *a a*, and fixed to a frame B B; this frame also supports the axis or main shaft C, to which is fixed the cone D. E E are two wings or leaves fixed to the cone; and *e* is a metallic segment, fitted into a groove made in the curved edge of the leaf, and pressed towards the chamber by springs in order to prevent the escape of steam. F is a circular plane, revolving on a shaft or pivot G, and supported by the main-shaft (as shown in fig. 4). The oblique position of this circular plane, it will be seen, is so adjusted that its surface shall be parallel to, and in contact with, the side of the cone. H is a metallic ring fitted into a groove round the cone, and divided into segments, which are pressed towards the chamber by springs, to answer the purpose of packing. I is a metallic ring for the same purpose, fitted round the circular plane. K is a cylindrical brass for the pivot G to work against *e*, regulated by a key *k*. L is a conical brass guide, kept in its place by a set-screw *l*. M is a screw-pin for giving oil to the pivot. N N are conical brasses for the main-shaft to work in, and kept in their places by set-screws *n n*. *o o* are screw-bolts for securing the engine frame. P is a pinion or small wheel, for the purpose of communicating the power of the engine to machinery which may require a different speed. V is one of the slits or openings, in the obliquely revolving circular plane, through which the leaves work; this slit is of equal length with the leaf, and widening outwards from the surface of the plane, to accommodate the change of the angular position of the leaf, which takes place during each revolution. *v v* are metallic rods, kept tight against the leaf by springs, to prevent the escape of steam. WWW are thin flat arms for supporting the circular plane.

* It must be owing to this, we presume, *that our contemporary*, "The Repertory," has *given so unintelligible*, and, in many respects, so absurd an account of this engine in the No. of that Journal for the present month.

Fig. 2.

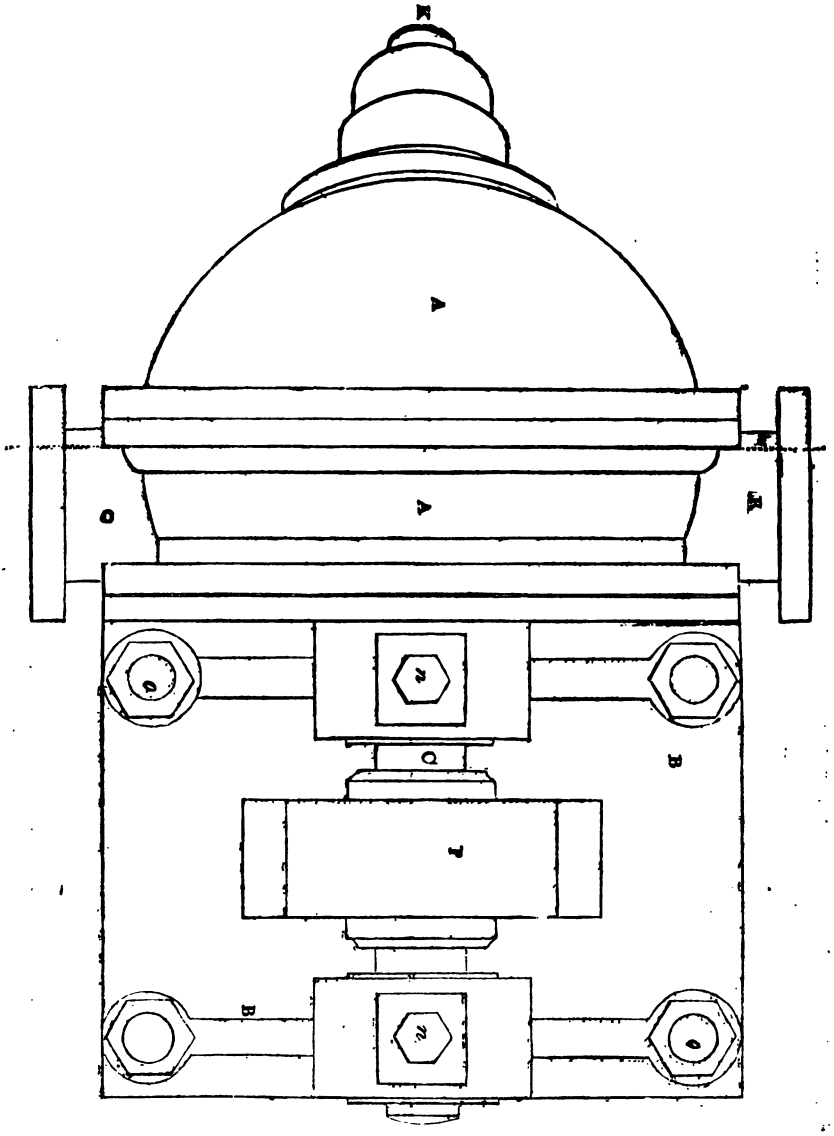
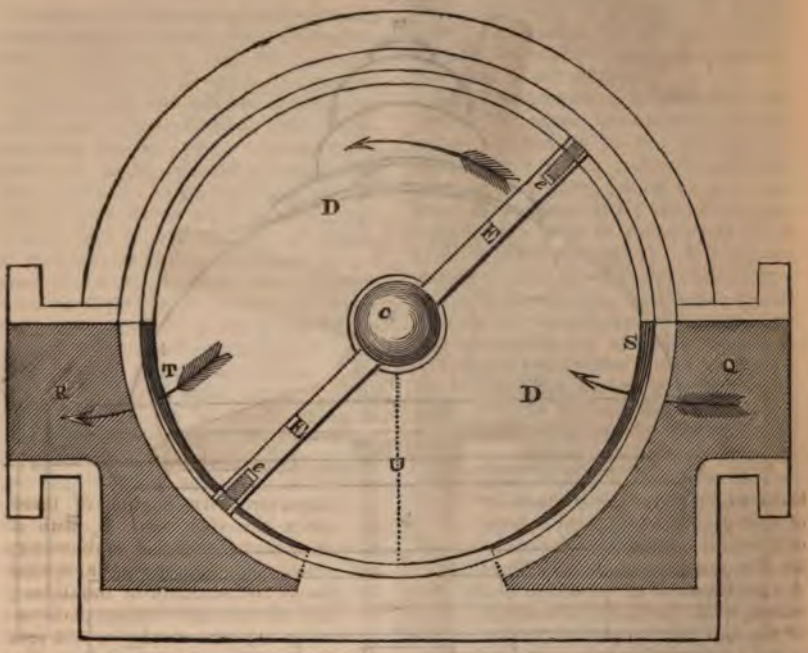


Fig. 2 represents the plan or top-view of the engine, showing the exterior of the circular chamber, the frame-work, main-shaft, pinion, &c. (It may be as well here to state, that similar letters are used to denote similar parts in all the figures.) Q is the pipe through which the steam enters the engine, and R the pipe through which it escapes.

Fig. 3 is an end-view or cross-section of

Fig. 3.



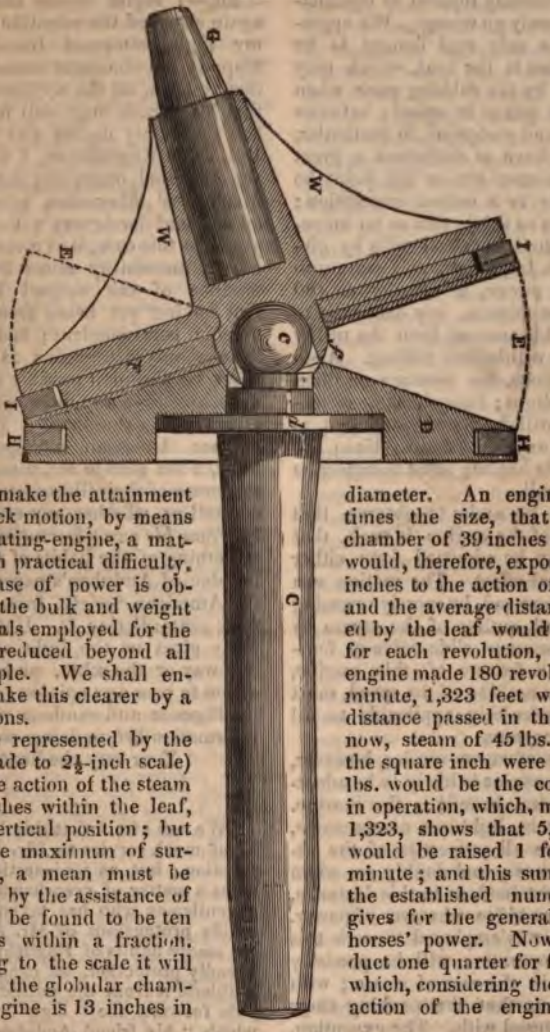
the engine, taken through the dotted line marked in fig. 2. The steam passes from the pipe Q into the circular chamber through an opening S cut through its side; this opening is of a triangular shape, and made as wide at the top as the circular plane is there distant from the base of the cone, and gradually tapering off downwards. T is the opening through which the steam escapes, and in every respect similar in construction. The dotted line U shows where the cone and the circular plane come in contact. *e e* are the metallic segments, already described.

Fig. 4 is a detached view of the cone in the circular plane, representing a section through their centres. It will only be necessary to observe, that *d* is a collar on the main-shaft, by which the cone is fixed thereto; that *c* is a socket-ball, working in the socket *f* of the circular plane; and that the dotted lines EE show the precise shape of the leaves or wings fixed to the cone.

Having thus described the nature and *construction of Mr.* Ericsson's engine, we shall now proceed to explain the manner in which it is set to work. Steam being admitted into the pipe Q (see fig. 3) it passes through the opening S into the circular chamber, and being there prevented from passing the line U, where the cone and plane come in contact, it presses against the upper leaf, which, together with the cone, then revolves in the direction of the dotted arrow. Now, as soon as the said leaf gets below the top of the opening T, the steam that has been acting escapes through that opening into the pipe R, and thence into the atmosphere or into a condenser. The opposite leaf then operates in a similar manner, and so on as long as steam is admitted.

Many as have been the engines contrived for the production of rotary motion, we recollect none in which that result has been obtained by such a perfect harmony of operation among the different parts. Not only the general action of this engine, but the action of every part of it is rotary. The consequence is, that it is wholly free from those serious draw-

Fig. 4.



backs which make the attainment of a very quick motion, by means of a reciprocating-engine, a matter of so much practical difficulty. A vast increase of power is obtained, while the bulk and weight of the materials employed for the purpose are reduced beyond all former example. We shall endeavour to make this clearer by a few calculations.

The engine represented by the drawings (made to 2½-inch scale) presents to the action of the steam 12 square inches within the leaf, and is in a vertical position; but that being the maximum of surface exposed, a mean must be taken, which, by the assistance of fluxions, will be found to be ten square inches within a fraction.

By referring to the scale it will be seen, that the globular chamber of this engine is 13 inches in diameter. An engine of three times the size, that is, with a chamber of 39 inches in diameter, would, therefore, expose 90 square inches to the action of the steam; and the average distance performed by the leaf would be 7,35 feet for each revolution, and if the engine made 180 revolutions in the minute, 1,323 feet would be the distance passed in that time. If, now, steam of 45 lbs. pressure to the square inch were used, 4,050 lbs. would be the constant force in operation, which, multiplied by 1,323, shows that 5,358,150 lbs. would be raised 1 foot high per minute; and this sum divided by the established number, 33,000, gives for the general result, 162 horses' power. Now, if we deduct one quarter for friction, &c., which, considering the harmonious action of the engine, is amply sufficient, the available power will be 120 horses!

That so great a power should be produced by a globular vessel of only 3 feet 3 inches diameter, is a result so extraordinary, that the attention is naturally and anxiously drawn towards any probabilities by which it may be defeated. The probability of the action becoming affected by leakages first presses itself on our *consideration*. On this head it may suffice to observe, that as none of the packings require any other play than to be moved gradually against their respective surfaces as they wear away, all that is required to ensure tightness will be good workmanship. The next contingency which suggests itself is the ordinary one, of liability to derangement. On this score, however, there is but little to be feared, for the engine is of so few parts, and the mutual action and reaction

of these parts is so simple and natural, that unless wantonly injured or obstructed, it can scarcely go wrong. We apprehend that the only real danger to be guarded against is the heat, which may be generated by the rubbing parts when the engine is put to its speed; between the bearings and gudgeons, in particular, as they will have to withstand a great force. Experience can on this point be the only guide to a correct conclusion; but we incline to think, that as no inconvenience is found in cotton-mills by giving shafts of a large size, and communicating great power, a velocity of 180 revolutions per minute, any deduction to be made on this account from the utility of the engine will be but trifling. As to the packing-rings, the pressure on them will be but slight; indeed, their centrifugal force will be nearly sufficient to give them always an outward bias; the danger of their heating must therefore be extremely small.

It may not be amiss to observe, that the principle of the engine is such, that the steam may be admitted from either side with equal effect. The motion can therefore be reversed, by merely reversing the inlets and outlets of the steam by means of a common slide-valve or four-way cock — a feature of this engine, which, to say nothing of its speed, must render it particularly applicable to all locomotive purposes.

The branch of steam-service, however, in which this engine is likely to be adopted with greatest benefit is the marine. In steam-vessels, lightness, compactness, simplicity, are all properties of the utmost importance; and doubly so, when they can be obtained, as in this instance, without any sacrifice whatever of power.

When water is employed to work this engine, the operation will be precisely the same as in the case of steam; with this exception, that the packing rings may be dispensed with. The exception, however, is of a nature which shows that as a hydraulic engine it will work even better than as a steam-engine; of this, however, more hereafter. At present, we trust we have said enough to satisfy our readers that the great space which we have devoted to this latest wonder of the mechanical world has been not unworthily occupied.

MR. AUDUBON.

Sir,—I regret to see that you have again attacked the scientific character of my highly-esteemed friend Audubon. Happily his character stands, with justice, so high, all the civilized world over, that his friends may well feel very careless about any doubts you may express. But, as an Englishman, I do not like to see a Journal, occupying the place of the Mechanics' Magazine, attacking such an eminent foreigner, without some reply. In this case, it is clear, as in many others, incredulity arises from utter ignorance of the subject he describes. Not having yet heard from my Philadelphia correspondent; and knowing as little about rattlesnakes as you or any other Englishman possibly can, I cannot unluckily give any direct answer to your attack on his statements. Perhaps some of your American correspondents (who have, I am glad to see, already taken up the cause of their illustrious countryman) can tell us, whether any man, who really, *from his own observation*, does know something of the habits of these reptiles, has denied Audubon's paper, read before the American Society, from *knowledge of facts contradicting it*. Until some such party gives us the light of experience, one way or the other, we are in *no condition* to pass any opinion; and a man of intelligence and candour will seek such information before doing so.

Your very obedient servant,

QUIVIS.

[We are afraid that this letter will not be of much service to Mr. Audubon's reputation; but, as its insertion is demanded as a matter of even-handed justice, by a gentleman who has taken both the scientific pretensions of Mr. Audubon, and the manly habits of Englishmen under his friendly protection, we cannot venture to withhold it from the public eye. *Quivis* puts forward the "high" "character" which "his friend Audubon" possesses, "all the civilized world over," as a sufficient reason why his friends should "feel very careless" about any doubts *we* of the Mechanics' Magazine may express. But he forgets, that if there is any truth in the doubts which *we* of the Mechanics' Magazine have expressed, the high character which Mr. Audubon has hitherto enjoyed, goes for nothing. Our case is, that he has acquired that high character undeservedly; and it is for those who desire that he should preserve it, to

show that the grounds on which we have dissented from the prevailing opinion, are unworthy of regard. As yet, however, no person has offered to do so; even "Quivis" does not, with all his zeal for his "highly-esteemed friend," say that he for one, believes the stories which Mr. A. has told of the rattlesnake, to be true. He says, indeed, that "in this case, as in many others, incredulity arises from utter ignorance;" but, as he does not himself profess to have any personal acquaintance with the animal in question, we think we are equally entitled to say, that "the utter ignorance," and folly to boot, are more likely to be on the side of him, who swallows without looking, and quarrels with his neighbour for not doing the same. *Quivis* calls on our *American* correspondents, to say, "whether any man, who really, from his own observation, does know something of the habits of these reptiles, has denied Audubon's paper, read before the Wernerian Society;" but here again he forgets—he forgets that it was by two *Americans* (Dr. Jones and his —"scientific friend")—by two fellow-countrymen of Audubon and the rattlesnake—that the truth of Audubon's stories was first called in question; and that we Englishmen of the Mechanics' Magazine, are but the echoists and enforcers of the objections and doubts of these gentlemen. Besides, it is by no means necessary that a man should have had a personal acquaintance with rattlesnakes, to be able to judge whether the extraordinary freaks and exploits which Audubon has ascribed to them, are consistent with probability. There are certain principles of animal existence which even rattlesnakes cannot overstep. When we had some time ago the pleasure of a personal interview with *Quivis* on this subject, he was pleased to say, that he had no objection to leave the question of Audubon's credibility to the determination of a certain eminent professor of natural philosophy, who, though neither American-born, nor forest-bred, was, he admitted, fully qualified to pass a sound opinion on the probabilities of the case. We now beg to inform him that we have seen and conversed with this eminent naturalist on the subject; and shall be well content if he can prevail on that gentleman to make public all that he said on the occasion.—ED. M. M.]

PROGRESS OF STEAM-TRAVELLING—OGLE AND SUMMERS'S EXPERIMENTS—MACERONE AND SQUIRE'S, &c.

Sir,—From the manner in which your *correspondent Trebor Valentine*, acknowledged, in No. 416, that he had never seen a locomotive carriage, I fancy he has not since constructed one; I, therefore, do not think it worth while again to combat his opinions—at the same time I wish no better proof of the truth of my assertions, than the trial named at the foot of page 243. He will find the carriage does advance only four inches on moving the power point 12 inches. Had the problem at page 441, vol. 16, been a "glaring absurdity," it had not sullied your pages; I leave its solution as a test of the locomotive knowledge of my opponents. I consider there is no scientific question before the world of so much importance as this one of mechanical locomotion. I have pursued it for several years, and I mean still to pursue it, even to completion, if possible. Who ever thought an ascent on plain wheels of one in six possible, until I declared it done four years ago? Now it is pretended to be thought little of. It is one of the postulates of my theory of locomotion, that *a certain power will do the same locomotive work, whether that power be applied statumotively or locomotively*—in other words, that a carriage of a certain weight may be propelled at the same speed by a certain power, whether that power be within the carriage, or act upon it from a distant fixed point; or again, that an engine of 4-horses power (exclusive of its own weight) may be made to propel a stage coach at the same rate that four living horses draw it. Being sure of this point, I consider a great step gained towards perfecting the practice of locomotion.

I am rejoiced at every improvement I hear of, from whatever quarter, as all improvements will, I believe, ultimately further my own particular views; but I am unable to ascertain what are real improvements.

The experimental journey of Messrs. Ogle and Summers, is now going the round of the periodicals. They say they have expended £30,000—an appalling sum! Their water feed (exclusive of dead working stock in the boiler) is 100 buckets, at say only four gallons per bucket=400 gallons, or 4000 lbs. weight. They usually work at 200 lbs. per inch pressure. Their cylinders are 12½ inches diameter, consequently the absolute pressure must be *forty-seven thousand one hundred and forty pounds*, being a gross

power of 188 horses, at 250 lbs. per horse (which is as much power as an ordinary coach-horse will exert, when going up-hill about 2¼ miles an hour, or piston rate); but take off the odd 88 horses for friction, &c., and leave 100 horses power available to be put in action to convey 23 persons and their luggage! *Cui bono?* Now, Mr. Editor, if all this be true, certainly the power is injudiciously wasted, or something is wrong here. Such an engine should be sent to unwater the Cornish mines, instead of supplanting a stage coach. If it be not true, how injurious to publish it! I wish I could make or purchase a small locomotive of 1-10th this power; all my expectations would then be realized.

Saxula says that V. S., page 383, is one of the exaggerators, "Up the *steepest hills* at more than eight miles an hour!" For steepest hills, read cockney hills; country hills are different things: there are some real steep hills in my neighbourhood, and carriages always drop to about one-fourth of their regular rate when mounting them; this is what I want steamers to do, by using a long lever in such cases—for how absurd to carry a great steam power along the levels, or gentle ascents, where it is not wanted!

Do these immense-power makers know that it only requires a power of 12½ to advance a ton along a good level road, with a lever equal in length to the wheel radius, as shown by Mr. Walker's valuable experiments, detailed in vol. 13, page 76, of the Mechanics' Magazine. Is not this a fact laughing us all to scorn?

Yours, &c.

SAXULA.

September 11, 1832.

HINTS ON THE CHEMICAL CHARACTERS OF CONTAGION; THE THEORY OF VENTILATION AND FUMIGATION; AND ON THE PROBABILITY OF OUR ARRIVING AT A KNOWLEDGE OF THE ACTUAL NATURE AND COMPOSITION OF MIASM. BY MR. ABRAHAM BOOTH, PRACTICAL CHEMIST AND LECTURER ON CHEMISTRY, &c.

I have not been an inattentive observer of the great interest which has *been excited in every* department of the *profession, by the fearful* and destructive ravages of the cholera morbus, as well as of the various plans by which it has been proposed to counteract its influence. It has, however, rarely occurred, that the interest of the profession has been directed to inquire into the causes of this, as well as of other contagious diseases, unless, indeed, by those speculations, which have indicated its origin, to be animalcular. Chemistry appears to me to afford the most certain, unerring, and undeviating guide by which we can form any correct notions, on this very interesting branch of inquiry; and it is a matter of satisfaction, that where the immediate objects of analysis end, analogy may take up the investigation with almost equal probability of arriving at correct conclusions.

My reflections upon this subject lead me to assume, that the *poison of cholera morbus*, is like that of *plague, typhus*, and *yellow fever*, &c., as, wherever in similar instances, the communicability of the disease appears to depend upon fomites or miasm, there is a chemical substance of animal origin, which is the germ of the disorder, and which cannot but be fully developed, when this is introduced into the human system, either through the medium of the stomach, lungs, or skin; that the accumulation of these poisonous matters, in any part of the atmosphere, which before was communicated merely by contact or proximity of infected persons or things, where the disease is raging, may give to it those characters, which properly belong to an epidemic, and by deteriorating the atmosphere to a considerable extent may widely extend the sphere and influence of the disorder:—and, also, that if it is a chemical substance, it must necessarily act the part of a chemical agent, on other parts or peculiar localities of the atmosphere, which are impregnated with the gaseous products of organic matter, and that these may assume the characters of the poison of the contagion, or at least operate as ready diluents to extend its morbific influence.

It would be an interesting and valuable branch of scientific inquiry, to ascertain the causes, and classify those gaseous organic products, which are either salutary or detrimental to the animal economy. The combinations of hydrogen and nitrogen, we know generally to be wholesome, exerting a very

salutary action upon those individuals who are exposed to their influence, and even possessing the characters of valuable therapeutic agents. Of such nature I consider to be the matter exhaled from animal flesh, and which causes the employment of a butcher to be of so wholesome a nature; the exhalation from some animal bodies in a state of decomposition, as, for instance, in a manufacture generally considered to be the most wholesome to those engaged in it, the preparation of cat-gut; and the exhalation from night soil, cow-houses, and tanners' liquid, which have long and probably with reason, been considered salutary and beneficial in several states and stages of disease. On the other hand, there is also a very extensive range, which is detrimental to the animal economy; this includes many animal matters and odours, the gaseous products of animal and vegetable decomposition, &c., and where phosphuretted hydrogen, carburetted hydrogen, sulphuretted hydrogen, carbonic acid, carbonic oxide, and, I am inclined to add, cyanogen, which, we have reason to assume, is a very extensive product of the decomposition of animal bodies, are the extensive causes of disease and decay.

We may infer that the matter of *miasm* or *contagion* is a chemical substance, from the action of the various preventive agents, which have been established as such in their real or reputed efficacy. Such is heat, in its property of decomposing the combination, from the facility with which changes in the constitution of organic products may be effected through its agency, and to which I am inclined partly to attribute the action of the vapour bath, in the incipient stages of the cholera morbus. Chlorine gas and nitrous gas; acetic acid and camphor (the two last of which have long been established as popular applications) are very powerful chemical solvents, and in the very subtile state, in which their particles are generally distributed, when exposed to the atmosphere, they may be considered to act as effective and powerful agents in the solution or decomposition of the still more subtile matter of miasm. The action of carbon, as an anti-putrescent and anti-sceptic agent, and its power of arresting the incipient stages of animal and *vegetable decomposition* are well known. It is, therefore, very likely to act powerfully in the purification of the atmosphere, and in the destruction of miasmatic vapours. The smoke of gunpowder, and of burning tar, which have both been directed, and in many cases efficiently employed, in restricting the course of contagious disease, consists of carbon, in a state of highly minute division, and very eligible for the full developement of its properties. It is, perhaps, not a mere problematical assertion, that the smoke from the pit coal of the fires in our metropolis and large towns, aided by the gas lamps of the streets, have very considerable influence in purifying the atmosphere, and may have tended to restrict the ravages of the present disease, and prevent its assuming more generally the characters of an epidemic.

But another most important effect in the purification of the atmosphere, is probably water. Dilution is considered to be the most efficient means of modifying the power of the matter of all contagious diseases; and no agent is probably so efficient in removing these noxious combinations from the place of their formation, or distributing them more generally than water, whether in the form of condensation as rain, or in its evaporation from the earth, when being taken into solution or suspension, they are removed into the higher regions of the atmosphere, until they are again precipitated to the earth in a modified form by its subsequent condensation. Besides the power which water possesses of holding bodies in solution, there are evidently cases in which it raises the particles of matter by pure mechanical suspension, as is obviously the case with many earthy particles, and particularly those used in the domestic operation of cleansing wines, the odour of which is very sensible in the evaporation of the water. The distillatory process of water in evaporation indicates the efficacy of its employment in the purification of the atmosphere, and its copious use in washing the streets of the metropolis cannot but be beneficial; but in order to ensure this effect it is necessary that the thorough ablution of the streets should be attended to, in order to remove those organic matters, which by undergoing decomposition produce a deteriorated atmosphere that acts as a powerful diluent to extend the disease. Such I likewise conceive to be the atmosphere

of close and crowded rooms, and confined streets, which is extensively deteriorated by the gaseous products of animal and vegetable exuviæ, &c. I was somewhat surprised, some time since, to peruse in the *Times* journal, some remarks of Dr. Ure, condemnatory of the practice of watering the streets, and instancing the facts that the cholera morbus had at that time almost entirely restricted its ravages to those quarters of the metropolis which were low and marshy. But the case of the evaporation of water from the streets cleansed by thorough ablution, and that of low marshy districts in which organic decomposition is continually going on, to an extent which renders malignant diseases endemic to the localities, can admit of no possible analogy. The wholesome process of watering the streets of our large cities is, in all probability, one great cause of their increased salubrity over earlier times.

The atmosphere is the grand recipient of the volatile products and compounds of Nature's operations; it is the laboratory in which all the manifold processes of volatility are continually going forward, as distillation, sublimation, composition, and decomposition. Its contents, in addition to the chemical elements of its composition, are the mineral vapours from the earth; the volatile exuviæ of organic compounds, whether fluid or gaseous; the products of combustion and of respiration; and animal and vegetable bodies in every form of combination and decomposition. Thus it may be supposed to include every form and species of gaseous combination known to us, and others which have yet eluded our present attempts at investigation, and do not, therefore, come within the range of the immediate objects of chemical inquiry.

Although none of these gaseous compounds, in the very dilute form in which they must positively be contained in the atmosphere, could operate as active stimuli to the disorganization of the animal frame, or to produce disease; yet they, perhaps, afford a very few out of that large range of volatile combinations which it is not impossible but that the elements of organized bodies may enter into. In what manner, likewise, may not their modification, by the powerful agency of electricity, render their powers more *active, when applied,* to bodies whose *susceptibilities* are increased by the action and peculiar state of this fluid? The combinations of carbon and nitrogen open a very wide field for inquiry; cyanogen is at present their only known definite form of combination; a substance, the chemical characters of which were analogous to those of this compound, was detected by Dr. Lambe in his very elaborate analysis of Thames water, and to which he with great propriety referred the noxious properties of this fluid, rather than to the inert vegetable or animal matters, which it is proved to contain. Of what nature, likewise, can be the poison of cheese, of black-puddings, of sausages, &c., but to some similar combination of these elements, and the nature of which may be educed by the same satisfactory means of investigation as were adopted in the researches of the above gentleman? May not an extensive range of subtile gaseous combinations exist, and the last refined be the *matter of contagion*? My conjecture is sanctioned by the rules of chemical analogy.

It is not improbable, however, but that the composition and analysis of the matter of contagion may yet be determined. It is not unlikely but that it may be found in combination with some substance possessing the greatest affinity for gaseous matter; and I would submit that the analysis of rain-water, descending in the streets and other places where the poison of contagion is most concentrated, affords good grounds to believe that we may thus obtain some information upon this almost problematical point of inquiry. It is well known that all rain-water contains considerable quantities of organic matter in solution, and which it removes in its descent through the atmosphere, as very considerable traces are afforded by its decomposition when suffered to remain for a short time exposed to the air. By a series of analyses, on the actual contents of rain-water, formed at different times, and under peculiar states of atmospheric variation, it is probable at least that we may obtain some information upon those peculiar states of the atmosphere, which is often deteriorated, generally or locally, to such an extent as to render its reception or inhalation, altogether foreign to the purposes for which it is designed, as the vivifying principle in the economy of nature.

August 23, 1832.

INDIAN ARTS AND MANUFACTURES.

No. 6.

Indian Alchemists.

It is not, I believe, generally known, that the study called alchemy, which, in Europe, has merged into the invaluable science of chemistry, has not yet been obliterated from the face of the globe, but still continues to be pursued in the east, the land of its birth. In most of the large towns of India, there are many men of fortune, and even women, who waste their time, health, and money, in pursuit of that chimera, which always appears within reach, but still eludes the search.

The grand desideratum of alchemists to which all their efforts are directed, is to transmute the baser metals into gold and silver, and that this is capable of being performed no native has the slightest doubt; but the alchemists attribute their numerous failures, like the perpetual-motion seekers, not to the impossibility of their succeeding, but to some trifling omission or defect in their manner of making the experiment; and, like our above-mentioned friends, with their innumerable wheels and pumps, the alchemists have their never-failing nostrums, a few of which I subjoin as a specimen of their chemical knowledge:—

1. A ball of paste, must be made of a seer* of wheat flour, kneaded with the juice of the mudar plant (asclepias gigantea); in the centre of this put a tola† of arsenic, and cover the whole with new cotton cloth, over which must be also covered a cake of clay. This is then to be burnt in a seer and an half of dry cow dung, the arsenic is then to be taken out of the ball, and being covered with fresh paste, this operation is to be performed for fourteen successive days, at the end of which time the arsenic becomes (khak) dirt or ashes. These ashes are then to be put in a crucible, into which some quicksilver must be poured, and on that some powdered charcoal; it must then be put on a fire, when, as my recipe truly says, "khoda chahe" (if God will) pure silver will be obtained; and one tola of arsenic ashes will suffice for 500 tola of quicksilver.

2. Into an earthern pot put five seers of lime, and in the middle of the lime one seer of pure tin. On the top of this, lute another earthen pot, with a small hole in the bottom; into the upper pot fill five seers of taree (the fermented juice of the palm-tree); when the taree, running into the lower pot through the hole, has well quenched the lime, break the pots, and the tin *should be* found converted into silver.

3. Make a hollow ball of copper, like the shell of a cocoa-nut, with a small hole at one end, into which must be screwed a copper stopper—this must then be filled with equal quantities of the juice of the mudar plant (asclepias gigantea) and that of the bur tree (Ficus Indica) and one tola of orpiment, and one tola of cinnabar; the stopper must then be screwed in, and the ball put into a very hot furnace, when it must be left till cool the ball will then be found converted into gold!

4. There are innumerable other recipes, equally efficacious, on which my informant tells me he has spent large sums of money; amongst others, he boiled three bottles of brandy with two tolas of mercury, till the whole evaporated, and on his breaking the pot, expecting his reward in the shape of a piece of silver, he was surprised to find nothing whatever.

Although the natives of this country have not the least idea of the science of chemistry, and are unable to deduce any cause from its effects, accident has revealed to them many of its secrets, amongst others, that of gilding by amalgamation.

I once met with sulphuric acid for sale, but the maker of it himself believed it to be the essential oil of sulphur, and called it "ittur" of sulphur, as he would have said, "ittur" of roses; he was also aware that a mixture of sal ammoniac and lime, boiled together in water, would produce a strong pungent smell; but the reason of this was quite indifferent to him. Few natives have any desire to inquire into what they do not understand; their general answer to any suggestion of improvement, is, that the "abhuwa" (water and air) of this country is quite different from the "abhuwa" of Europe.

BERGEIN.

Poonah, February 14, 1832.

* A seer is 40 tola.

† A tola weighs 3 drams.

REPORT OF THE COMMITTEE OF THE FRANKLIN INSTITUTE OF PENNSYLVANIA, APPOINTED MAY, 1829, TO ASCERTAIN, BY EXPERIMENT, THE VALUE OF WATER AS A MOVING POWER.

(Continued from last Number, p. 396.)

The necessary details in relation to the friction of the several smaller wheels, will precede the account of the experiments made with each of them.

Before passing to a detail of the experiments, it may assist the reader to give a brief statement of the principal points to which the researches of the committee were directed.

The first and most general subject for determination, was the mode of applying any given head of water, so as to produce the greatest ratio of effect to power expended.

To ascertain this point, regard was to be had to, and variations made in, the head of water, the diameter of the wheel, the point of application of the water to the wheel, the size of aperture through which water was admitted to the wheel, the form of gate which was applied to the chute, the form, number, and position of the buckets, and the velocity of the wheel.

The second object was to determine for a given wheel the form of bucket which would admit of the application of the greatest quantity of water, giving the maximum amount of effect, without diminishing the ratio and effect to power expended.

Wheels of four different diameters were used in the experiments; No. I. had a diameter of 20 feet, No. II. of 15 feet, No. III. of 10 feet, and No. IV. of 6 feet. A particular description of each wheel will precede the statement of the experiments made with it.

The experiments were begun with wheel No. I.; this wheel, as has been stated in the general description, was 20 feet in diameter, 20 inches in breadth, and 16 inches, in the clear, between the cants, which were 6 inches deep.

The buckets first attached to this wheel were *elbow buckets*, these were 15½ inches deep, with a width of elbow of 3 inches, and an opening at the throat of 2⅝ inches. In sector A, B, C, (fig. 3), these buckets are represented, *e*, *e*, &c. the number around the whole circumference was fifty.

In the bottom of each bucket an air-vent was provided, ⅛ths of an inch wide, and occupying the breadth of the wheel; each vent was placed in the upper part of the bucket, to which it belonged, as near *as practicable to the* elbow of the preceding bucket. *The* air-vents were closed during the experiments when the contrary is not stated.

The overshot chute, delivering water to the wheel on the pitch-back principle, is represented at *d*, No. 1, fig. 1.

To this chute three different forms of gates were applied. The first, *a*, fig. 1, was formed of a block three inches thick, and was opened by a motion towards the right, given by the series of levers, *l*, *l'*, *l''*, K, fig. 1, already described. The width of opening given by this gate was regulated by a series of notches upon a block, affixed to the top of the forebay, against which the end of the connecting-rod, *l'*, *l''*, (fig. 1) was carried. These notches were regulated by trial. The same method of gauging the width of the opening was applied to the other apertures. When gate *a* was opened, the water flowed between its end and the top of the chute. Table A contains the results of the experiments made with this gate, under different heads.

This series of experiments being completed, the gate *b*, fig. 2, was adapted to the same chute; this gate drew upwards, allowing the water to pass between the lower part of the gate and the floor of the chute. Experiments similar to those, with gate *a*, were then made; the results are given in table B.

Gate *c*, fig. 3, was next adapted to the same chute; this gate, of a wedge form, being drawn to the right, allowed the water to pass between the tops of the gate and of the sluice. Table C contains the results obtained with this gate.

The elbow buckets remaining in the wheel, experiments were made with different heads and different widths of aperture, the water being applied at Chutes Nos. 2, 3, 4, 5, 6, and 7, successively. These points of application, taken together with Chute No. 1, embraced the cases of overshot, breast, and undershot wheels. The heights of the several apertures above the lowest point of the wheel are, No. 2, 17 feet; No. 3, 13.66 feet; No. 4, 10.46 feet; No. 5, 7 feet; No. 6, 3.66 feet. No. 7 was the undershot aperture. The horizontal lines *f g*, *h i*, *k l*, *m n*, and *o p*, show the points from which these several heights above the bottom of the wheel were reckoned. The chutes through which the water was delivered from these openings, were at the entrance 16 inches by 2½ inches, and contracted in depth (the width remaining invariable) to 2 inches, at the end where the water escaped to the wheel.

The three forms of gates (*a*, *b*, and *c*) having been found nearly equally effective, either one could be applied as the convenience of opening and closing, in the

position to be assumed by the gate might dictate. Fig. 1 shows that Chutes Nos. 2, 3, and 7, were closed by gates similar to *b*, and Chutes Nos. 4, 5, and 6, by gates similar to *c*. The experiments with each chute, under the various heads, will form the subject of one table.

The required results having been obtained with the elbow buckets, they were removed from the wheel, and the buckets represented in sector F, C, G, (fig. 1), substituted, the faces converging to the centre of the wheel. The different heads of water were then tried with each chute, and with different widths of aperture, as before. These experiments will be presented with the others in a tabular form.

Air-vents, similar to those already described, were provided in the bottoms of these buckets.

The series of experiments with the *centre buckets* having been completed, the buckets figured in sector D, C, E, (fig. 1), and afterwards those in sector H, C, I, were substituted. If from any point in the periphery of the wheel, two tangents be drawn to a circle, described with the centre of the wheel as its centre, and a radius of 15½ inches, we shall obtain the lines determining the two different buckets for that point; each bucket being equally inclined to, but on different sides of, the radius of the wheel drawn to the point, assumed, in the periphery. In sector D, C, E, the tangents to the upper side of the circle are drawn, determining the positions of the first set of *inclined buckets*. In sector H, C, I, the tangents to the lower side, giving the second set of inclined buckets.

In presenting the results of the experiments, each table will contain a single subject, and will be designated by a letter serving as a reference. To accommodate the tables to the size of the page, they will be divided into parts, designated by numbers. The general tables, as may be seen by table A, Part I. consist of 18 vertical columns, and in addition, a space for observations; each column has, at the bottom of the table, its appropriate figure of reference.

Column 1 contains the numbers by which any particular experiment may be referred to; the experiments are numbered from one upwards, through the whole extent of a table. The next three columns refer to the head of water used: column 2, containing the heights of water above the aperture; 3, the height above the top of the bucket, at which the water first strikes the wheel; and 4, the height above the bottom of the same bucket.—The heads above the apertures were measured in *apertures*, Nos. 1, 2, and 3, by the heights above the lowest points of the tops of the gate-seats, in Nos. 4, 5, and 6, by the heights above the lowest points of the several gates when closed, and in No. 7, by the height above the bottom of the forebay, which was on a level with the bottom of the wheel. The lines *fg*, *hi*, &c. already referred to, are drawn through the points just designated, corresponding to apertures, Nos. 2, 3, 4, 5, and 6. The head, above the top of the bucket, was estimated for the overshot aperture (No. 1), by the height of the water above the highest point of the wheel; and that above the bottom of the bucket, by the height above the highest point of the soleing of the wheel. The heads, above the tops of the buckets, upon which the water first struck, were estimated for apertures, Nos. 2, 3, 4, 5, and 6, by the height of the water, above a point in each aperture, one half of an inch distant from the periphery of the wheel; the horizontal lines drawn through these points are shown in Fig. 1, Plate 8, by *rs*, *tu*, *vw*, *xy*, and *za'*. By adding the vertical distance between the top and bottom of the bucket at any aperture, to the head, found as just described, the head, above the bottom of the bucket, was obtained. The heads thus found are contained in column 4. In a wheel considered at rest, the point corresponding to the bottom of the bucket, at which the water was delivered, would give the first point of action of the gravity of the water upon the wheel; but when the wheel is in motion, this point is generally lower down than the point which we have determined, the distance depending upon the depth of the bucket, and upon the relative velocities of the water and wheel. All the dimensions referred to, are given in feet, and decimal parts of a foot.

Column 5 contains the width of aperture, regulated by the distance to which the gate was drawn, determined in the manner already explained. The openings were increased by determinate differences, until the supply of water was more than sufficient to fill the buckets. The widths of the openings are given in inches and decimals.

The weight raised is given in column 6; this was varied with each head and aperture, until the maximum effect was reached and passed.

The friction, the method of calculating which has been given, for the machine under the particular weight raised, is contained in column 7.

Column 8 is the sum of the weights found in 6 and 7 for the different cases; the numbers represent, therefore, the total resistance overcome by the power. The

weights are all given in pounds and decimals of a pound.

Column 9 contains the height through which the several weights were raised, combined with 8, it gives the effect produced.

The time occupied in each experiment is recorded in column 10, in seconds.

By dividing the distance through which the weight was raised, by the number of seconds required to raise it through that distance, the rate per second, or velocity of the weight, was determined. The velocity of the wheel will, of course, bear the same proportion to that of the weight, as the radius of the wheel to the sum of the radii of the barrel and chain. To avoid any uncertainty in relation to this latter quantity, the ratio was obtained experimentally, by ascertaining the number of revolutions, and parts of a revolution of the wheel, required to raise the weight through a measured distance. The velocities of the wheel are given in column 11.

The weight of water expended in each experiment, determined by measurement of its bulk in the reservoir, is contained in column 12. It was a question, whether in these experiments which would occupy a period extending through a considerable range of temperature, it was necessary to apply a correction for the temperature of the water used, the water expended being measured, not weighed. Calculation showed that no such correction was necessary.*

(To be continued.)

* The temperature of the water used, was, during the winter, about at its point of maximum density, in the summer, not far from 75 degrees Fahr. Calling the specific gravity of water at 39.38 deg. Fahr. its point of maximum density, unity, the experiments of Haellstroem give for its density at 75.2 deg. Fahr. 0.9976. If we suppose two results are to be compared, one obtained at the minimum temperature of the water, the other at the maximum, they will differ but .0024ths of the greater weight. Thus, in a weight of water expended, of 10,000 lbs. the greatest difference could be but 24 lbs., or less than one division upon the gauge-plate, a number which would disappear in the ratio. Take, for example, experiment 15, Table A, which gives the highest number, contained in Part 1st, for the weight of water expended; this number is 4810 lbs.; suppose this experiment to have been made when the water was at its maximum density, and let us ascertain what effect will be produced upon the ratio, if this experiment were supposed to have been made with the water at 75.2° Fahr. The weight of water expended, occupying the same bulk with 4810 lbs. at the maximum density of water, would have been at 75.2_0 Fahr. $4810 \times .9976$, 4798.456 lbs.; this multiplied by the head and fall, 23 feet, gives for the power expended 110364.49 lbs.: the effect (column 15) is 91759.4, the *numbers in the columns* for power and effect in the *table are multiplied* by 10 to avoid placing the decimal point. But 110364.5 : 91759.4 :: 1 : .831, the ratio sought.

The ratio in the table, (column 16) is .829, differing but .002 from the number just found: the effect, therefore, of neglecting the change of temperature in this extreme case falls only upon the third decimal place, the figure in which place it alters slightly.

IMPROVEMENT OF ARCHITECTURE.

Sir,—When I ventured to propose a Society for investigating the subject of constructing chimneys, and for improving the appearance of London, I thought it best that it should embrace every description of persons disposed to assist, that the burden of each might be light. That the subject requires investigation, none can deny; this is admitted by your correspondent, p. 344. Indeed, our finest specimens of architecture are mostly disfigured by unsightly appendages as soon as they are finished. I have considered your proposition, but I much doubt whether any Society of Architects or Builders could alone accomplish the whole of my object (although I hope it will obtain their particular attention and patronage), and I am still inclined to think it will be better that the Society should be as comprehensive as possible, and its first exertions confined to the investigation of the true principle for the construction of chimneys, and to the removal of unsightly terminations until they are all removed. This done, they may pursue further improvements. There possibly may be some noblemen or gentlemen, of correct feelings and exalted minds, who would come forward to assist in the formation of such an Institution, not only that the deformities on their own mansions, whether in town or country, might be removed, but also that those on other houses which may be within their view, and on important public buildings, might be done away with.

Dr. Faraday, of the Royal Institution, has, I have been told, recently given a lecture in part connected with this subject; and if the Society which I propose could be formed, and could obtain his assistance, or the assistance of any other person equally capable of conducting an investigation, and who could give the matter a sufficient degree of attention, some valuable information, I doubt not, would very soon be obtained.

If the plans of Dr. Franklin, Count Rumford, or those of any other individual, would admit of general applica-

tion, what occasion can there be for the terminations of which I complain? Neither of the authors named have stated, nor do I know whether the reason has ever been published, why it is that one chimney requires the application of a remedy, and another is so constructed that it has sufficient draft without, and with an open top during all sorts of weather the ascent of the smoke is never intercepted. There are, I am convinced, limits to the forms for the construction of chimneys, which cannot be passed without producing smoky ones.

The degree of perfection to which the supply of water, the drainage, the lighting, the paving, &c., in this metropolis have been carried, induce me to hope that a general and great improvement may be effected with regard to the exit or the total destruction of smoke.

In all great undertakings Acts of Parliament may be required; and if this, which is so intimately connected with the comfort of all, cannot be attained without one, I trust that a Company will be formed, or that in the proposed new Building Act the subject will be introduced.

Some of the Welsh coal is said to be a perfect remedy for smoky chimneys, for it does not produce any smoke. If it emits nothing else to render it unpleasant or injurious to health, it is to be hoped it will soon be in general use in London.

If all the smoke could but be consumed, and every unsightly chimney-top removed, how delightful it would be to pay visits to the clean roofs of our houses!

I had written thus far before I received your 473d Number, in which "R." most ably comes to my assistance. Persevere, persevere, Mr. Editor, and do not slack your hand; continue to invite others, and some good will undoubtedly be the result.

I will not now make any observations on "R.'s" opinions respecting the construction of chimneys, because I am persuaded mere data, obtained from actual experiments, scientifically made, are absolutely requisite before any just conclusions can be drawn.

I am, Sir,

Your obedient servant,

C. D. S.

RAILWAYS AND CANALS.

We inserted in our last No. an article under the above head in which the *Athenæum* was somewhat roughly-handled by a correspondent, for what he calls "a review" of Grahame's Letter to Wood, which appeared in the August Part of that Journal. He represents the "*Athenæum* Reviewer" as being "practically unacquainted with the subject," and altogether "incompetent to discuss a question of so great national importance as the relative merits of railways and canals." We have since had the curiosity to turn to the article in the *Athenæum* itself (which we ought, perhaps, to have done before we inserted the remarks upon it), and we deem it only fair to state, that we find in it but small foundation for the attack made on the capabilities of the writer. The article is not a *review* at all, and does not *appear among the reviews*. Neither does the writer *profess* to be qualified to criticise or "discuss" the matter in hand; on the contrary, he states very modestly that though an admirer of science, he is "*not* skilful in its singular powers;" and he gives Mr. Grahame's statements, as he says, "without comment." We feel the more pleasure in making this amends for the injustice of our correspondent's animadversions, that it affords us an opportunity of bearing our humble testimony to the ability by which the reviews of the *Athenæum*—when it does review—are almost always distinguished. As regards our correspondent's strictures on Grahame's letter itself, we think him altogether in the right; and we trust he will not imagine that we feel the less obliged, for his clever exposition of its blunders and mis-statements, because we have thought it proper to volunteer this correction of the mistake which he has made—in the hurry, no doubt, of writing—as to the manner in which they found their way into the pages of our contemporary.

THE PENNY PRESS—USEFUL KNOWLEDGE SOCIETY.

The insertion in our last Number of F. H.'s letter on the penny-paper mania, has led to our being favoured with more letters on the subject, and on the respective merits of our cheap contemporaries, than we could find room for, were we to devote the Magazine to them entirely for a month to come. We are glad, however, to observe, that in none of them is the correctness of our correspondent's statements impeached; and that the bitterest of them amounts to no more than a difference of

opinion on points about which all men are free to differ. We are happy, therefore, to think that we may, without injustice to any of them, yield to the necessity which dictates to us to decline all controversy on the subject. We shall leave our correspondent's strictures to speak for themselves—well satisfied that they will not go for more than they are worth.

On the subject, however, of the Useful Knowledge Society's interference with the freedom of the book-trade—which is quite a distinct thing from the merits of their penny whistle—we would just hint to an "Ex-Member of the Committee" and to our esteemed friend, "T. M. B.", that it will be time enough to talk of "paltry jealousies," "mercenary rivalship," "patriotic feeling," and all that, when a satisfactory answer is given to the financial exposure contained in last week's *Athenæum*, which, if it be correct, shows that the whole thing has degenerated into as mere a job for the sake of filthy lucre, as ever insulted the moral sense of the public.

The *Athenæum* animadverts on the sectarian influence which such corporate associations are likely to have on society, as "a question of immense importance *that has not been yet touched upon.*" We must in justice to ourselves state, that on the very first formation of the Useful Knowledge Society we distinctly pointed out that such would be the necessary tendency of its proceedings, and that we have never missed any fair opportunity of enforcing the view we originally took of the subject.

We foretold from the first, both how the Society would be jobbed, and how it would be opposed by rival associations. For a long time we stood alone in these our opinions, and many have been the annoyances we have suffered on account of them; but we have now our reward in the coming to pass of all we predicted; and in the general conviction which is beginning to prevail, that in the book trade, as in every other branch of commerce, *to let alone*, is the only safe rule of conduct to be followed, by all who have really the interests of knowledge, and the welfare of their species at heart.

Railroads in France.—A committee of engineers has received orders from the French Government to prepare a general plan of rail-roads, which, branching from Paris, should form lines of communication with Rouen and Havre—Lille, with a branch to Calais, Dunkirk, and Valenciennes—Strasburgh, with a branch to Metz—Lyons and Marseilles, with a branch to Grenoble—Bourdeaux, Tours, and Nantes.

Humane Society Blunders.—In the "Directions" for the treatment of persons in cases of suspended animation, issued under the sanction of the Royal Humane Society, there appears to me to be several items extremely injudicious, and some of them even noxious. While the cautious administration of external heat is recommended, the body is to be gently rubbed with flannel, *sprinkled with spirits*; as if it were not a matter of notoriety, that the evaporation of spirits from any surface produces *an intense degree of cold*. The injection of tobacco smoke, however, is still worse. The direct action of this narcotic poison would be to paralyze the parts instead of exciting action. Dr. Paris characterizes injections of tobacco, as "one of the most stupendous errors that ever occurred in the exercise of the medical art."—*Murray on Restoring Suspended Animation.*

Safe Process of Manufacturing Gunpowder.—The almost infinite subdivision of paints effected by grinding them might, as it appeared to me, be imitated by grinding the materials composing gunpowder in some fluid in which these materials were insoluble. Nitre and charcoal are insoluble in alcohol, and sulphur is nearly so; hence in a properly constructed mill these substances may be ground in alcohol, and the greater part of the alcohol drained and pressed out, whilst the small residue will evaporate with great readiness. I made the experiment, and obtained a good powder at the first operation. Alcohol, however, was rather too volatile, and a substitute that was less so was a desideratum. This substitute was found in pure oil of turpentine, the resin having been previously completely removed; the oil when used was readily evaporated, and left the powder entirely free from adventitious matters.—*S. Guthrie: Professor Silliman's Journal.*

An Anti-Sediment.—The substance employed here (Craighall Colliery) is known by the name of *comings*, being the radicles of barley, produced in the process of malting, which are separated before the malt is sent to market. About a bushel of these is thrown into the boiler, and when the steam is again raised, an immediate effect is visible, for there is not only a plentiful supply of steam to produce the full working speed of the engine, but an excess of it is going waste at the safety-valve. This singular effect will continue several days. Such is the fact; but the principles by which the vegetable matter acts are not very obvious, as it is doubtful whether it acts chemically or mechanically; if its action is mechanical, chaff or saw-dust may produce the same effect.—*Milne's Practical View of the Steam Engine.*

Paddles Superseded.—Yesterday (7th Sept.) there was a little *fête* at Virginia Water, given on the occasion of an experimental trial of a newly-invented steam boat. The vessel was in miniature, and moved by clock-work. The precise nature of the invention will not, of course, be divulged for the present; but we understand the chief object is to dispense with the use of the paddle-wheel. The inventor is a Mr. Hale, a descendant of the celebrated Chief Justice Hale; and the experiment is said to have been successful.—*Windsor Express.*

INTERIM NOTICES.

Boy Stay is referred to the Erratum below.

Communications received from C. T. V.—Mr. Gorrie—E. S. L.—Mr. Mallet—Mr. Walter—A. B. C.—Mr. Rough.—Mr. Symington.

Erratum in last Number, p. 386, col. 1, l. 32.—For "stern" read "stem."

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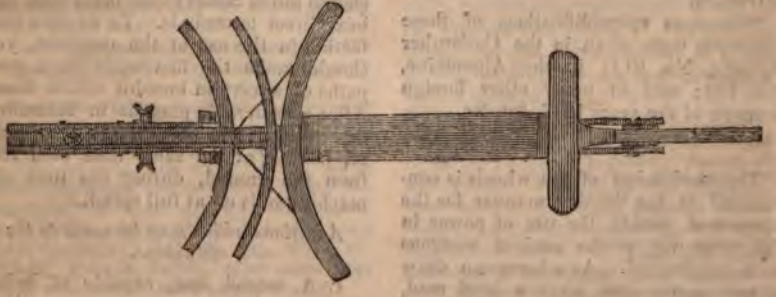
No. 477.] SATURDAY, SEPTEMBER 29, 1832. [Price 6d.

DRAIS' IMPROVED VELOCIPEDE.

Fig. 1.

Fig. 2.



BARON DRAIS' IMPROVED VELOCIPEDE.

Baron Drais was, we believe, the original inventor of the Velocipede, which made so considerable a figure in this country some fourteen or fifteen years ago. Since his arrival in England, he has been endeavouring to revive the use of it, and insists that it must have been owing to some error in the construction of our English edition of the invention, or great inexpertness in the management of it, that it fell into such general discredit amongst us. How far his notions on this head are founded on fact, or attributable to the self-delusion natural to all sanguine inventors, we presume not to say (though certainly we have a strong impression on the subject); but civility to an ingenious foreigner demands that we should lay before our readers his own description of his invention in its most improved shape, in order that they may judge for themselves. We need only further premise, that of the figures on our front page, one is a perspective view of the velocipede in operation, the other a plan of its construction.—Ed. M. M.

Description of the Velocipede, invented and improved by Charles Baron Drais.

By the Inventor.

Properties of the Invention.

1. It will travel up hill on a good footway as quick as a man can walk.

2. Upon a level, even after a heavy shower, as quick as a post horse.

3. Upon a level, and a dry footway, as quick as a horse in a gallop.

4. Down hill, as quick as a horse at full speed.

Numerous exemplifications of these properties were given in the Carlsruher Zeitung, No. 211; in the Algemeine, No. 404; and in many other foreign journals of the years 1817, &c. &c.

Principle.

The mechanism of the wheels is constructed in the simplest manner for the purpose of sparing the use of power in the same way as the ancient waggons were constructed. As a horse can draw a very heavy load upon a level road, when it does not lean too much upon his *back, so, likewise,* a man with my *machine can easier propel* his own body *than carry it himself.* This is easy to imagine, because a man can, for the small track of one wheel, generally look out the best place upon the road where the footway is generally dry the whole summer. The rapidity of the machine upon a smooth footway resembles the swiftness of skating, and the fundamental laws are similar. The quicker you are able to move one foot after the other, the quicker does the machine proceed forward during the time you rest yourself.

Down hill, the velocipede beats the best horses, and with less chance of accidents, as the hind wheel is quickly locked, and as the feet are always ready to stop with the rapidity of the machine.

Directions.

After the seat is taken in the manner represented in the prefixed fig. 1., sit with your body rather forward, and lay the hands with outstretched elbows firm upon the balancing board, and try to keep an equilibrium with the machine. With your hands hold the pole fast wherewith you are enabled to govern your own way at pleasure. This must chiefly be performed with the hands, because the under arm and elbows should remain rested, to enable you to have a fine feeling of keeping your balance. Putting your feet very lightly down, you are then to make large, but at first rather slow, steps, parallel with the wheels; taking care to turn your heels outwards, so that they do not come under the wheels. Should you happen to lose your balance, you can generally assist yourself with your feet, or with guiding a little upon the side inclining outwards; but, for turning round, you should guide rather to the inner side, and bear direct towards it. To acquire perfection in the use of the machine, you should make the first trials upon good paths of a certain breadth within doors. After considerable practice in balancing and guiding, you may then propel quicker, holding at the same time both feet from the ground, during the time the machine rolls on at full speed.

Additions which may be made to the Machine.

1. A second seat, capable of being loaded with other articles, travelling bags, &c.

2. A screen, that by favourable wind may be used as a sail, &c. &c.

Ladies' Velocipede.

A velocipede for the use of ladies, has three or four wheels, two in front, and a seat between; but does not do well for travelling upon the present footways, as more breadth is requisite than they afford. On good footways, however, of a certain width, you may have the pleasure of having a lady before you, and, as upon sledges, to run as quick as you please; the female has not the unpleasantness of the dust caused by the horse to endure; she sits deep enough not to jolt out, and has the pleasure of a clear view as far as the horizon.

REPORT OF THE COMMITTEE OF THE FRANKLIN INSTITUTE OF PENNSYLVANIA, APPOINTED MAY, 1829, TO ASCERTAIN, BY EXPERIMENT, THE VALUE OF WATER AS A MOVING POWER.

(Continued from last Number, page 414.)

Column 13 contains the head and fall, expressed in feet and decimals.

By multiplying the numbers of column 12, by the corresponding heads and falls from 13, the powers expended were obtained; the numbers expressing them are in column 14. The decimal point is omitted in this and in the succeeding column, as being unnecessary to the determination of the ratio.

Column 15 contains the numbers denoting the effect produced; these were obtained by multiplying the corresponding numbers in columns 8 and 9.

The next column, 16, gives the ratio of effect to power expended, the power being taken as unity.

The maximum effect under each head and width of aperture, is placed in column 17, that reference may be more readily made to the several maxima.

Column 18 contains the velocity of the wheel, which gave the maximum in each case.

The observations made during the progress of the experiments, are recorded in the remaining space.

Two experiments were always made under the same circumstances, when the results of these agreed it was not deemed necessary to make a third, but when they were discordant, a third, and, when required, even a fourth experiment was made to ascertain the point in doubt.

To give the two or three experiments made in each case, would be to add unnecessarily to the space which the tables must occupy; the numbers given are to be considered as so many mean results taken by those who, having been actually engaged in the course of experiment, could duly appreciate the circumstances rendering expedient the rejection of any experimental result. The tables thus become more valuable, by being rendered less voluminous and better adapted to practical use.

The tables will be followed by remarks upon them, and conclusions drawn from them; when necessary, tables will be given presenting condensed views of particular results, which are to be compared with each other.

We proceed to give the tables relating to wheel No. 1.

[Here follow *more* tables than we could possibly find room for. Already upwards of fifty pages of successive numbers of the Franklin Journal have been occupied with them; and we are not sure but there are many more yet to come. The Committee, it will be observed, promise to give at the end "remarks upon them, and conclusions drawn from them; and where necessary "tables, presenting condensed views of particular results." As these "conclusions" will, no doubt, embrace all the great practical results established by this important investigation, it is the less necessary that we should insert the multifarious details on which they are founded.—Ed. M. M.]

INDIA-RUBBER BALLS—CAUTION.

Sir,—I feel it my duty to caution Mr. Rough, and "the young gentleman" to whom he states himself indebted for the suggestion, as well as your readers generally, against the employment of expanded India-rubber balls, as floats for the support of the human body, (No. 475, p. 392) as they are *much too fragile* for such a purpose. Having had some little experience with these balls, I think it right to state that they are altogether unfit for any purpose requiring strength or durability. While in the distended state they become gradually weaker, until at length the power of cohesion is so much diminished that a very slight pressure is sufficient to burst them. Sudden contact with the corner of a piece of furniture, or any pointed substance, will at all times cause their immediate destruction. However, they have their uses, and as "pa-

lour balls," are productive of much harmless fun and frolic.

Bladders have been used as floats, and the practice is one of long standing: thus, Shakspeare,

> "I have ventured like little wanton boys that swim on bladders."
> HENRY VIII. Act 3. Scene 2.

In consequence of their occasional insecurity, however, bladders have fallen into comparative disuse, cork being usually preferred; but even bladders, with all their risks, are infinitely more secure than the flimsy India-rubber balls.

I remain, Sir, yours respectfully,
W. BADDELEY.

London, Sept. 18, 1832.

FINDING THE CONTENTS OF PLANE TRIANGLES.

Sir,—Tempora gives a calculation for the segment of the base at page 295; if he had gone the remaining step to obtain the perpendicular, he would have found, I think, that this mode is not shorter than the application of the well-known and tedious rule, "from half the sum of the three sides," &c.

If the perpendicular, or its half, is found and base given, the process for the content is so simple that it may be regarded as given also. My instrument will give a result as the sliding rule does, near enough for most practical purposes; at any rate the use of it, is a good check upon the long operation by figures.

Tempora has descended to particulars; he could not deny that the instrument is correct in its principle. And as to the "large square graduated board, and three rods or scales, turning on hinges and sliding in grooves," Tempora has erroneously noticed them; the appendages are not described by me as being such.

It needs but little now to see how the construction may be simplified, by detaching its parts and having them of pasteboard, &c., in which case my suggestions may be of use in a very especial manner to the land surveyor, and the schoolmaster.

If we want such niceties as "two or three places of decimals," the instrument like a geometrical construction, is useless; such nicety is seldom needed practically.

"The greater chance is, that one or more of the sides will be fractional," &c. Still the instrument is equally applicable to furnish a near result.

I am truly unwilling to occupy your valuable space; but, as you have devoted a page to the splenetic attack of Tempora, I hope these observations will be admitted.

I remain, Sir,
Yours, truly,
A.

September 9, 1832.

ERICSSON'S STEAM-ENGINE AND WATER-WHEEL.

Sir,—Some time last year, I made some experiments on a scheme for a steam-engine, somewhat analogous to that of Mr. Ericsson, given in your No. published to-day; but my plan was *totally different in its arrangement*,—and I abandoned it, not from the discovery of any deficiency in its theoretical principle, but because practical difficulties interposed insurmountable obstructions. I do not wish to be understood as applying such an observation to the ingenious plan adopted by Mr. Ericsson; but having previously considered the subject, I was at once struck with the following circumstances attending the working of this new engine, not pointed out in the description. I refer to the figures in your present Number, 476.

First—as the circular plane F, with its packing I, is necessarily of greater diameter and circumference than the base of the cone with its packing H, it is quite clear that as the circular plate and cone must each revolve in contact, in the same periodical time, there *must* be a constant *grinding* between their unequal touching surfaces.

Second—The pressure of the steam, tending to separate the circular plate and cone, exerts itself alternately on *one* quarter, increasing to *three* quarters, of their respective surfaces, but never upon the whole; it, therefore, has a powerful disposition to tilt or separate them obliquely, and consequently to create an enormous partial pressure either upon the packing, or, laterally, upon the axles, independently of that which must take place at the *ends*, and between the ball-and-socket at the apex of the cone. This pressure at the ends, when greatest, in an engine 30 inches diameter, with

steam, as instanced at 45 lbs. to the square inch, would be 40,000 lbs.

Third—As the packing at the edges of the wings C, must pass the wedge-shaped openings in the spherical diameter, through which the steam is admitted and discharged, it will be liable to injury, as it is alternately in and out of contact with the surface of the chamber in passing those openings.

Fourth—The packing AA, in the circular plate pressing against the sides of the wings, will be particularly liable to injury from its constant change of position, and also, because the whole force exerted by the wings in causing the revolution of the circular plate F, with all its grinding upon the cone, and the friction of its circle of packing *I*, must necessarily be communicated to that plate through the medium of the packing A A.

Fifth—The pressure of the steam is alternately increased and diminished one half, according as the surfaces of the wings exposed to its action, alternately increase and diminish in that proportion, as they must do from the construction of the machine; the action of the engine will, therefore, be alternately accelerated and retarded, unless the motion be equalized by a heavy *fly-wheel* added to the working shaft, or unless an equivalent effect be obtained from the machinery to which it gives motion, in which latter case there will be a severe *back-lash* upon the pinion P.

Sixth—Will there not be great difficulty in promoting leakage at all those angular points, where the different packings should, if it were possible, unite to each other, so as to form one continuous steam-tight packing?

Seventh — The quantity of rubbing surface of all the different packings is increased about *eight-fold*, as compared with that of an equal ordinary high-pressure reciprocating engine, *working at the same pace*, without noticing the friction of the axles, or the grinding between the surfaces of the plane and cone beforementioned.

Eighth—The observations in the concluding part of the description as to the *high velocity* with which Mr. Ericsson's engine may be worked, apply equally to any *practicable* rotary engine—but what packing will *long* endure a constant *friction, even at the rate of* 1323 feet per minute, *i. e.* 15 miles per hour? But this is only the *mean* motion of the wing taken at the centre of pressure; that of the extremity *where the packing must be*, is about one-third more, or 20 miles per hour.

I am, Sir,
Your obedient servant,
C. A. BUSBY.

Stanhope-place, Brunswick-terrace, Brighton.
September 22, 1832.

P. S.—Is not the machine in question a modification of Hooke's universal joint?
C. A. B.

[We have some remarks to offer on the preceding communication; but shall defer making them till we give the farther inquiry which we have promised, into the capabilities of Mr. Ericsson's engine as a water-wheel.—Ed. M. M.]

REPORT OF THE FRENCH INSTITUTE, ON THE MEMOIRS, BY M. MANESTIER, ON THE PROGRESS OF STEAM NAVIGATION IN THE UNITED STATES of NORTH AMERICA.

(Translated and abridged for the Mechanics' Magazine*).

The Minister of Marine and the Colonies having requested the opinion of the Academy of Sciences upon the Memoirs which M. Manestier had laid before him, containing observations which he made during his stay in the United States of America, and the principles deduced by calculation, by him, as an engineer, the Academy appointed a commission consisting of Sané, Biot, Poisson, and myself (Dupin) to examine the work.

We shall first submit to the Academy the observations which refer to

Steam Navigation as applicable to Merchant Ships.

Sixteen years since† there was not in the whole continent of North America a single steam-boat used for commercial purposes. At the present day (1823) there are several hundreds; and already the inhabitants of the new world have derived immense advantages from their use.

* It is a considerable time since this Report was made, but it has never before (we believe) appeared in a translated form in any English work; and makes now, through the kindness of an esteemed correspondent, a valuable addition to the collection of papers published in this work on the progress of Steam Navigation. In many points it is very erroneous; and to these we may hereafter take an opportunity of directing the attention of our readers.—ED. M. M.

† That is, in 1807; the Report is dated 1823.

Whenever a new motive power is successfully introduced into any one branch of human industry, it soon benefits a multitude of others; it accelerates improvements in all the arts; it gives to those who first employ it, or who use it upon the largest scale, an immense superiority over others. Frequently the decline of the prosperity, riches, and strength of nations is the necessary consequence of the adoption and progressive application of a new species of mechanical power. Such have been the effects produced by the employment of steam power. The English were the first to apply this power to raise water. It was soon found that the alternating power employed to work the ordinary pumps was capable of being applied to the lifting of heavy weights, the raising coals and minerals to the drawing-carriages, and, finally, to almost every description of art and manufacture. England, as we have said, first availed herself of this new method of adding to the powers of human labour; and her productive power has risen in a few years to that degree of superiority which now constitutes the splendour and power of the British empire.

Observing that steam power had been so useful in those works to which it had been applied on land, it was natural to inquire if it might not be able to perform similar services on the water? Experience had long attested how painfully slow was the navigation of rivers against the stream, and what immense power of men or horses must necessarily be employed. The aid of the wind was brought into play through the mechanism of sails; but all navigation, whether of seas or of inland waters, was still attended with great fatigue to man. To say nothing of the insurmountable obstacles arising from storms, and still more from calms, the progress of sailing vessels was always uncertain, and sometimes dangerous during the prevalence of contrary winds.

It was a Frenchman (M. Duquet) who first made a successful attempt to substitute mechanical power for that of the wind*. His experiments were made between 1687 and 1693 at Havre.

In 1698, Captain Savary, availing himself of certain hints thrown out by the Marquis of Worcester, invented the steam-engine. He contrived a boat to be put in motion by paddle-wheels; a plan which, at a subsequent period, was used with great success in the new mode of navigation. But Captain Savary appears never to have had any idea of proposing, as a first mover, that power which he had obtained by his steam-engine; indeed, it was not yet sufficiently perfect to produce a uniform motion.

In 1736, Jonathan Hulls, in consequence of the improvements which Newcomen had made in Savary's engine, proposed its application to the propelling of vessels by means of paddle-wheels. He took out a patent for his plan, and tried, but without success to interest the English Admiralty in its favour. Amongst other objections upon which the refusal of the Admiralty was founded, was the following:—"The violence of the sea would break in pieces every part of a machine so placed as to work in the water!" To this Jonathan Hulls replied immediately:—"It is absurd to suppose that this machine should be used at sea during a storm, and whilst the sea is raging." That which Jonathan Hulls, the inventor of steam-boats, did not suppose any one would conceive to be possible, was eighty years afterwards proved to be not only possible but advantageous.

It is evident the plans suggested by Jonathan Hulls were never carried into effect. In 1775 M. Perier constructed the first steam-boat. This boat was tried upon a piece of still water, but it moved very slowly, because the power of the engine was only equal to one horse. Even with this small power, however, the boat was able to stem the current of the Seine. M. Perier afterwards gave up the speculation.

In 1781 M. De Jouffroy built a steam-boat at Lyons, of large size; it was no less than 46 metres* in length (147ft. 9in. English). The current of the Saone being very gentle, was well adapted for experiments of this kind. Cæsar called it most appropriately *lentissimus*. Several accidents which occurred compelled M. de Jouffroy also to abandon the prosecution of his scheme; and when the Revolution broke out he left France.

Fifteen or eighteen years after these early attempts M. Desblancq obtained a patent from the French Government for the construction of steam-boats.

Soon after this a mechanic came to Paris, who afterwards became celebrated. It was Fulton, who commenced a series of experiments on the subject near the Ile de Cygnes†.

* It is curious to observe the eagerness of individuals of different nations to claim the honour of this important invention for the nation to which they belong. But the facts of the case prove that steam was never successfully and advantageously *applied to navigation* until the present century; *and that it was first profitably* employed in America.

* One hundred metres = 109½ yards English; or, 1 metre = 3.942 inches.

† It appears that Fulton availed himself of the published results of the experiments made by other

From 1785 to 1801, Miller, of Dalwinston, Clarke and Symington, in Scotland, Lord Stanhope, and Messrs. Bunter and Dickinson, in England, made several trials with steam-boats, but none of them were attended with complete success.

From 1785 or 1786, to 1790, we find Messrs. Fitch and Rumsey, in America, applying steam-power to navigation. Notwithstanding the successful results of their experiments, they met with so poor a reception from their countrymen that they came to Europe to endeavour to induce some one to adopt their plans. It presents a coincidence worthy of notice, that for several years Fulton could not meet with any of those great facilities or advantages which he expected in France. He made an offer to the First Consul to employ steam-boats in the flotilla, which was then preparing for an invasion of England, but it was rejected. Despairing of succeeding in the old world, Fulton directed his attention to the new, and resolved to convey the invention which he had just perfected in the bosom of France across the Atlantic. He was encouraged in this design by Mr. Livingston, then Ambassador from the United States to the French Government.

Mr. Livingston was himself the author of several plans for navigating vessels in the open sea by the agency of steam; having proposed successively to employ horizontal wheels; wheels with oblique surfaces, like those of a mill; paddles like ducks' feet; scoops, endless chains, &c. The importance of steam navigation was so much felt, and the possibility of supplying the power of the wind by mechanical power, so generally acknowledged in America, that in 1798 the state of New York granted Mr. Livingston a patent for 20 years, on the express condition that before the 27th March, 1799, he should produce a boat that would go at the rate of four miles an hour. He made use of a steam-engine five or six times larger than that used by M. Perier, and was more successful; but he did not obtain the velocity required by the Legislature, because the power he applied was as yet too small. Fulton made use of more than treble this power, having had a steam-engine of twenty horse power made by Boulton and Watt, in England, which was sent to America, and put on board the first steam-boat he built at New York. In 1807 this boat commenced running. To go the 120 miles between New York and Albany she required 32 hours in ascending and 30 in descending. So decisive an experiment carried conviction to every mind. Companies with large capitals were speedily formed in all parts, in order to undertake the building and running of steam-boats. The subscribed stock of some of these companies was immense; and the advantages derived from this fine invention by the United States exceeded the expectations of even the most sanguine.

The successful application of steam-power to navigation in America was soon known throughout Europe. Then it was, that a discovery which had been carried from the old world to the new; brought back from the new to the old; and then sent again from the old to the new—was destined to return a last time to be naturalized in the land of its nativity.

In 1812 the first steam-boat for the navigation of the Clyde was built, and was attended with complete success. In 1816, when one of us (Dupin) visited England he found this kind of navigation flourishing, and well understood.

In 1815 experiments were made in France, but the plan pursued was bad; the engines employed were imperfect; and the local difficulties were very great. The attempt miscarried, and the parties concerned in it were ruined.

In this state of things, the Minister of the Marine followed the only course which prudence dictated. He resolved to send to the United States an able and experienced engineer, who should institute on the spot a complete and detailed examination of the existing works of this kind, and the results obtained. Such was the design of the mission so well fulfilled by M. Manestier.

At the same time the Minister of Marine ordered Captain Montgery, who then commanded a ship on the American station, to inquire how far the system of steam navigation might be made applicable to naval warfare.

M. Manestier appears to have subjected every thing which came under his notice to the most rigorous examination and to correct admeasurement; and has neither inferred nor reported any thing that is not worthy of belief and may be relied upon. After reducing the statements which had been current of the extraordinary performances of the American steamers to their proper value, he came to this general conclusion, that there remain sufficient advantages in favour of this system of steam navigation to warrant its adoption on the European seas and rivers.

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of the Society for the Improvement of Naval Architecture, just prior to this period; and on them, as data, founded his calculations as to the power required to overcome the resistance at certain velocities. The subject ought *now* to be further investigated, and the recent experiments of M. Walker followed up.—*Translator.*

although with a much less comparative advantage than on the American rivers and lakes; of which England already affords a proof.

"Necessity is the mother of invention." Never was maxim more completely verified than this has been, by the invention of steam-boats, and by their introduction into the country where this invention was first rendered profitable and useful. When Louisiana was ceded by France, it gave to the American Union the whole course of one of the finest rivers in the new world; while the Indians, being driven back or subdued, were forced to abandon or to concede those immense tracts of country by which it was intersected, and which could not be penetrated without great difficulty by any other route. It was then that a species of navigation was introduced, which, successfully overcoming the rapidity of the current, did not require either the power of the wind nor towing-paths, which it would be impossible to form on the miry banks of a river at present clothed in all parts with ancient forests.* In the short space of fifteen years, several considerable towns have been founded, where it was considered scarcely possible to erect the huts of a village-settlement (bourgade), and are now the seats of an active and thriving commerce.† The settlement of countries till now uninhabited has been rendered not only possible, but easy, by the simple mechanical power of steam; and a mode of navigation, which has not existed more than fifteen years, has given birth to states which are now admitted into the great federation of North America. In 1820 a state was admitted into the Union, whose territory included the upper parts of the Missouri. The increase of the population (to which this state owes its origin) is the result of the great facilities of communication furnished during the last eleven years by the steam-boats on the Mississippi and Missouri. Such are the benefits which science and industry confer upon civilized society!

From any part of the mouth of the Mississippi a steam-boat can ascend that river and the Missouri to the Yellow Peter River, a distance of 2700 nautical miles; a greater distance upon a single stream than the total navigable portion of the rivers of Great Britain.

In several states of the Union fossil-coal is found in abundance. In some places the boats which convey passengers and produce pass near the mines, which supply them with their moving power. Where this fuel is not to be had, the banks of the rivers are clothed with immense forests, whence wood is to be had for little other expense than the cost of cutting it.

Although we have already made great progress in Europe (especially in its more civilized parts) we cannot expect to have, in the same degree, these facilities and advantages. Steam navigation has not produced such rapid changes in the old world which it fortunately effected in the new; simply because the European nations already possessed in abundance those means of conveyance which were wanting in America. In many places, however, the new system of conveyance has such numerous and decided advantages as to claim from men of science that they should do their best to improve it, by uniting the lights of theory to the experience of the practical engineer.*

After giving the history of which we have here presented the leading facts, and pointed out the principal results, M. Marestier describes the form and gives the dimensions of those steam-boats which he saw in America.

The first boats built by Fulton were flat-bottomed, like praams†. In 1813, they began to give a rounder form to the bottom, and since that time they have built all their boats with a regular curvature in the longitudinal and transverse sections of the bottom, but still so flat as to draw but little water.

"Perhaps," as M. Manestier well remarks, "when the depth of water is not limited, it would be advantageous to approach still nearer to the galley form which the experience of several ages has

* In countries where the cost of manual labour is very high, steam-boats must necessarily answer. "However," says M. Manestier, "upon the lakes and bays, and rivers whose current is slow, and course direct, such as the Hudson, they cannot compete with the ordinary vessels in the conveyance of goods; but when the current is rapid, or the rivers winding in their course, such as the Mississippi, and they are obliged to strike sail and take to their oars, there being no towing-paths, then the steam-boats prove their superiority."

† Before the introduction of this new mode of navigation on the Mississippi, Canada supplied by the lakes, the wants of a part of the new states of the Union. A great quantity of merchandise was sent from Baltimore, Philadelphia, and New York to Pittsburgh; from whence it was forwarded by water, into the western states. At the present time these states receive almost all the imported articles they require direct from New Orleans; the trade of which is greatly increasing, and new *settlements are daily forming* upon the banks of *these rivers, which are navigable* by steam-boats.

* This remark now remains in as full force as ever; no very good practical work having yet been published on the subject.—*Translator.*

† A kind of hat-bottomed vessel, with massy perpendicular sides; similar to some of the canal barges in England.—Translator.

proved to be best adapted for navigation by means of oars."*

Dimensions of the Boats.

The length varies from 35 to 45 metres, and rarely reaches 50 metres.

Breadth, from 45 to 10 metres.

Depth, usually from 2 to 3 metres.

Draught of water, from 12 to 2 metres.†

The first boats were very narrow; their breadth was not more than one-tenth of their length. Their breadth is now one-fourth or one-fifth of their length, by which the length and draught of water have been diminished without reducing the capacity, and, above all, without injuring the stability which is rather augmented by this plan.

In short, although for the same draught of water in a wide boat, the transverse sections have more area, than in a narrow boat, yet that part of the vessel which has to support the enormous weight of the engine, paddle-wheels, &c. being very full, is consequently supported by a larger volume of water. And the vessel has less tendency to strain from the unequal distribution of weight in the vessel, and the upward pressure of the fluid without.

In order that a correct idea may be formed of the strength of these boats, the author has given the dimensions of the principal scantlings used in their construction, which is always very slight.

In several of the boats intended for the conveyance of goods, the engine is on deck; in those intended for passengers, it is in the hold‡. M. Manestier has particularly described the plan of fitting-up the births of the latter vessels.

In some cases, the paddle-shaft is placed in the middle of the length of the vessel, in others at one-third of the vessel's length from forward; most of them are *between* these limits.

In the boats propelled by low-pressure engines, the density pressure of the steam seldom exceeds two-thirds that of the atmosphere, that is the mercury in an open tube communicating with the steam in the boiler, is seldom raised more than 50 centimetres, whilst the mean barometrical height is from 60 to 65 centimetres.

M. Manestier has also carefully ascertained the powers of the engines as compared with the boats they propelled. We have previously remarked that the failure of those, who at different times undertook to construct steam-boats, was more a consequence of their having made use of a moving power by far too small, than want of a good arrangement of their machinery.

In order to determine the power of the engine requisite to propel the vessel with a given velocity, it was necessary to ascertain the loss of power occasioned by every species of resistance to which either the vessel or engine may be subjected.

Fulton was the first who attempted these calculations, and he succeeded. The results of the experiments made in England by the Society for the Improvement of Naval Architecture, furnished him with approximate data sufficient to point out within what limits he should confine himself. From that time the success of his speculation became mathematically certain.*

Fulton is considered a man of genius by many, simply because he was the first who succeeded in navigation by steam; but who can refuse the same honour to most of his predecessors in the same course? Almost all of them contributed something towards its success. One suggested the use of the paddle-wheel, another the employment of the steam-engine; engineers had shown that the alternating action of the steam-engine was easily changed to the rotary one required for the paddle-wheels; they had even constructed steam-boats, in which all these plans were combined, and would travel, although slowly. In short, more power was all that was required to obtain a suitable increase of speed. In

* There can now be no doubt of the correctness of this suggestion. It has been acted upon, in some measure, on the boats recently built—which are decidedly faster than those formerly built. It appears probable, however, that still farther improvements in form might be advantageously made. Some of these I may point out at some future time. —*Translator.*

† Length, from 115 feet to 149 feet 6 inches.
Breadth, from 15 feet to 32 feet 9 inches.
Depth, from 6 feet 6 inches to 9 feet 9 inches.
Draught of water, 4 feet to 6 feet 6 inches.
N. B.—The fractional parts are omitted in the smaller dimensions.—*Translator.*

‡ Some of the boats recently built in America for the conveyance of passengers, have their boiler and engines fixed on deck, and, in some instances, upon the sponcing work close abaft the paddle-cases, the engine on one side and the boiler on the other, with a strong barricade to defend the passengers from injury in case of an explosion—Trans.

* It is greatly to be regretted that the experiments of Mr. Walker, a few years since, were not carried on to a greater extent. A series of experiments made with boats of known capacity and figure, at different velocities, and immersed to different depths, would do more to advance steam navigation than volumes of theory founded upon hypothesis merely. Such experiments upon a sufficiently extensive scale are beyond the means of an individual. Mr. Walker merits the cordial thanks of every friend to the science of naval architecture, for having thus shown how experiments may be made, the results of which would confer a great practical benefit on steam navigation.—Translator.

vulgar estimation, all the merit due to his predecessors, is annihilated by the great success of Fulton, and he alone receives all the credit, while others, whose labours tended to ensure his success, are only kept in remembrance by occasional historical notices.

Fulton by no means carried his theoretic researches so far as he might have done for the improvement of steam navigation. He did not ascertain the exact position of the machinery, nor the size and form best adapted for the different parts of the hull and machinery of a steam-boat.

M. Manestier has turned his attention to the mathematical examination of the subject. He commences by giving the particulars of the size and form of the boats, and the position of the principal parts of the machinery in the most approved vessels in the United States, and applying to the data so obtained the rectifications of mathematical science, he thence obtains a practical rule for all builders who wish to construct steam boats on correct principles. Of course, every such mathematical law must be subject to the speed of the vessel, the density and temperature of the steam, and the loss of power from friction of all kinds. Perhaps, too, these laws are not yet sufficiently known for us to expect perfectly correct results from any calculation of the effects depending upon them. It is not merely the numerical value of the results obtained which are uncertain, but also the relation between the quantities capable of being submitted to calculation. Nevertheless, we know by experience, that as the relative mathematical proportions which we derive from hypothesis, approach to or recede from, the correct results given by nature or obtained by art, we shall then be in possession of those practical rules which we could never have obtained without an approximating theory. Such is the plan which has guided engineers in those branches of their art where science has not yet been able to give perfectly correct solutions; and such is the course which M. Manestier has followed to arrive at the results upon which we have to report.

In analysing the data taken from ten boats which he saw, he has shown, 1st. the usual pressure of steam; 2d. number of revolutions made by the paddle-wheels in a minute; 3. the velocity of the piston in the same time; 4th. the proportion of the paddle to a rectangle, whose dimensions were equal to the breadth and depth of the immersed part of the vessel;* 5th. the velocity per second of the inner edge of the paddle, which should be, at least, as great as that of the boat; if it is not, that part of the paddle would tend to retard the progress of the boat; 6th. the velocity of the boat per second in metres for mathematical calculation, and the number of knots per hour for the use of nautical men; 7th. the number by which the product of the speed of the boat, divided by the number of double strokes of the engine, is to be multiplied, to give the diameter of the paddle-wheels; 8th. the multiplier, which gives the speed agreeably to the following formula:—the diameter of the cylinder multiplied by the square root of the product of the velocity of the piston, and the height of a column of mercury supported by the steam, and this product divided by the square root of the product of the breadth of the boat, the draught of water and the diameter of the paddle-wheels.

By the formula given in the notes to the first memoir, M. Manestier comes to the following conclusions, which are, however, for the most part to be considered only as expressions approximating to those correct principles of which we are yet ignorant:—

1st. The cube of the speed of the boat is much less than the power of the engine divided by the resistance of the boat, and the cube of the mean rate of the wheels, is much greater than this quantity, which is the cube of the mean of the two velocities; which mean velocity cannot be attained if the wheels are infinitely large.

2d. The speed of the boat is in direct ratio to the cube root of the power of the engine, and in inverse ratio to the cube root of the resistance of the boat, and the quantity $1-\frac{a}{b}$. The resistance of the boat being represented by b^2, and that of the wheels by a^2.

3rd. The product of the formula $\sqrt[3]{1+\frac{b}{a}}$ found for one boat, gives an analogous quantity $\sqrt[3]{1+\frac{b'}{a'}}$ for another boat, differing but little in its unit. The speed of a boat is nearly proportional to the cube root of the power of the engine divided by the cube root of the resistance of the boat.

4th. The speed of a boat is, therefore, nearly equal to a constant co-efficient, multiplied by the cube root of the product of the height of a column of mercury supported by the steam, the square of the diameter of the cylinder, the length of the stroke, and the number of strokes per mi-

* *M. Manestier has also investigated the comparative advantages of large and small wheels with regard to the speed of the vessel, &c.*

nule. This product, divided by the square root of the breadth of the boat and its draft of water, will give the value already cited as the multiplier for the simple speed.

This multiplier, it will be observed, is not a constant number; it varies from 20,29 to 27,6 in those boats upon which M. Manestier has made his calculation. The mean of these multipliers, with the exception of one, which M. Manestier rejects, because he is not certain of the speed of the boat, is 23.41. However, M. Manestier prefers the number 22. But from the examples in which he has applied this number, it seems clear to us that it would have been better to employ the first.*

It is important to observe, that the multiplier found by M. Manestier depends upon the perfection of the engine, the good or ill arrangement of the machinery for transmitting the power of the engine to the propulsion of the vessel, the construction, form, and proportion of the hull of the vessel, &c. In proportion as these several parts are improved will the multiplier for the speed be increased. It also increases with the size of the boat, all other things being equal. This increased velocity of large vessels, carefully noted by qualified persons, would show the progress made in the art of steam navigation.

Let us now pursue the examination of the proportions given by M. Manestier between the various elements upon which the velocity of a steam-boat depends. By a simple application of the method of maximum and minimum, he arrives at the following conclusions:—

The velocity of a boat ascending any stream ought to be once and a half the velocity of the current, that the expenditure of power, i. e. the consumption of fuel may be the least possible; but this speed is almost always less than what is required for commercial purposes, and particularly for the conveyance of passengers. When the boat ascends with once and a half the velocity of the current, it requires three times the previous power, if it acts on board either by a steam-engine or horses, than when hauled up to a fixed point on the shore.*

When the current is very strong, if the power be on board, it is more advantageous to ascend by hauling by a rope to a fixed point beyond the vessel; but in ascending against a gentle current, and in all cases of descending with the current, it is best to make use of paddle-wheels, moved by a power on board the vessel. The principle of these kinds of motion has been investigated by several engineers, who have made use of the first for passing bridges or ascending rapid streams, whilst they have generally preferred the latter for descending.

M. Manestier has also given, in a note, the necessary calculations for finding the approximate results of the effects of condensing high-pressure and rotary engines, used for propelling boats. He notices the great economy of fuel in the use of high pressure engines, and in no wise participates in the fears which, in Europe, have prevented their use in navigation.

Having noticed the whole of the mathematical conclusions which were come to by M. Manestier, we next come to the description of the steam boats built in America.

With the details of the construction and fittings, he has also given complete plans of "The Chancellor Livingston," a vessel of 400 tons, propelled by an engine of 60 horse power; "The Fulton," noted as the first boat whose bottom was not perfectly flat; "The Washington;" "The Savannah," which has three masts, and has made the passage to Liverpool and Petersburg by occasionally using the power of the sails and the engine; and "The Paragon," which is designed by the inventor to be the model of a steam boat carrying its sails upon two masts.

* In applying the number 22 to the "African" steam-boat, built for the French navy, M. Manestier found that it gave too small a speed by 0,04. Taking 23.41 as the multiplier, a result was obtained which did not differ 2 per cent. from the actual speed. If 22 is taken for the mean value of the multiplier, as M. Manestier has done in his memoir, it will be found in several instances not to be the true speed by a tenth part. For instance, the "Virginia," with a speed of 3.3 per second, requires 25.24 as the multiplier. In this case 22, taken as a multiplier, would give a speed too small by 15 per cent.; 23.41, taken as the multiplier, will give too small a speed by nearly 8 per cent. With regard to the "Delaware" and the "United States," which gave multipliers less than 22, he ought to have ascertained whether there was any thing peculiar in their form to account for the extreme smallness of their multipliers. On referring to M. Manestier's notes to his memoir, it will be found that one of these boats has very full lines, and is not calculated for fast sailing; it is probable that a similar cause exists in the other boat to account for her dulness.† —*Note by M. Dupin.*

† It would probably be found that the multipliers of the greater part of the more modern American and English boats would be considerably larger than they required at the time M. Manestier wrote his remarks. There can be no doubt but that much more may be done in obtaining speed by greater attention to the model than has hitherto been paid. —*Translator.*

* Does not this, in some measure, corroborate the opinion expressed by engineers, founded upon the experiments made a few years since on the Forth and Clyde Canal, viz. that after attaining a certain velocity, the resistance from the water does not increase in the same ratio as before that time? —Translator.

M. Manestier has also described the double boats employed in England for ferry boats. The large platform laid upon the two boats, and over the space between them, in which the paddle-wheel works, renders these boats very convenient for the conveyance of horses, carriages, cattle, &c.; but they have less velocity than those with only one body of equal capacity to that of the two boats.

When they come to the shore they can reverse the motion of the wheel, and immediately check the boat's way, so as to prevent her striking the wharf.

In the United States they sometimes apply the power of horses instead of steam in the double boats. The author has described the machinery which this system requires—1st, When the horse-wheel is horizontal; 2d, When it is inclined. There is no doubt but that the greatest effect is produced in the latter case; but the labour is greater for the horses than on the other plan.

M. Manestier has justly observed, that the first idea of propelling boats with machinery driven by horses originated in our own country, as may be seen in the list of machines approved of by the Academy in 1732.

The fourth part of the Memoir, which is at once the most important and the least susceptible of analysis, contains a description of the steam engines used in the American boats. M. Manestier has given the plans and description of a double-stroke condensing engine, such as is now generally used on board the American steam vessels. We have already stated that the engine for Fulton's boat was made by Watt upon his own principle, which was forthwith followed in the United States. The Americans have availed themselves of the improvements made in Europe, as well as those of their own country.

The author gives the plans and description of a high-pressure engine, which he saw on board the Etna of Philadelphia. Engines of this kind are but seldom used for steam vessels. They are made by Oliver Evans, by whom they have been so much improved that they are worked on board the boats with steam, whose elasticity is equal to ten atmospheres. M. Manestier makes the following judicious remark upon these engines:—

"Many writers," says he, "have calculated the effects of the expansion of steam; but no one that I know of has paid any attention to the reduction of temperature which attends it. They have found the value of the expansion, which is considerable, and therefore unnecessary for me to notice. But they have not come to precise results, so as to be able to give the laws which regulate the formation and expansion of steam at high temperatures, nor observed that which attends the elastic force," &c.

In the actual state of our knowledge, we think that experience and observation alone ought to determine the length of time necessary for the admission of steam into the cylinder. In order to determine the thickness of the boiler, Oliver Evans makes use of the rule discovered by the geometrician Parent, a senior member of the Academy of Sciences, which Belidor has given in his "Hydraulic Architecture." The normal pressure against the circular end of a cylindrical tube is to the effort which has a tendency to burst this end, a tangent to the line which describes its circumference, as the circumference of this tube is to its radius. In calculating from this rule and the dictates of experience, the pressure which a boiler is capable of resisting, Mr. Evans allows for the strength being ten times greater than the pressure it will have to sustain when the engine is working at its highest power.* Consequently, unless from extreme negligence, it appears impossible that the pressure of the steam can be increased tenfold beyond its ordinary bounds, so as to be sufficiently powerful to burst the boiler. "If," says M. Manestier, "the safety valve be occasionally lifted, to ascertain that there is nothing to prevent its acting, there needs to be no apprehension about these engines, which, from their lightness, and the small space they require, the smallness of their prime cost and expenditure of fuel, are very desirable in many instances."

In 1818 Mr. Evans stated, and it has not been denied, that all the steam-boat boilers which had burst in America belonged to low-pressure engines. The only exception which has been cited is that of "The Constitution," which was constructed upon opposite principles to those laid down by Mr. Evans.

To show the effects of high-pressure engines upon the plan of this able engineer, M. Manestier refers to the engine at Philadelphia for raising water. It will raise upwards of 20,000 tons of water thirty metres high in twenty-four hours; and only consumes forty-three steres† and a half of wood, which is used instead of coal. It cost but 123,000 francs; whilst an ordinary engine, capable of producing the same effects would cost in America 200,000 francs.

* The crown of the boiler is of wrought and the bottom of cast iron.

† A stere is a measure of wood, equal to a cubic metre.—Trans.

The author has compared Evans's engines to those of Wolfe as improved by Edwards. The first occupy less room and are lighter; they have only to overcome the friction of one piston—in short, are less costly and more easily made; but Edwards's have also their advantages, being preferable when a very uniform motion is required, &c.

Lastly, M. Manestier describes a steam-engine which immediately gives to the wheels the rotary motion they require, without having recourse to any intermediate machinery. M. Manestier has described an engine of this kind of sixty-horse power, fixed on board the Surprise. In working this engine (made by Mr. Stiles, of Baltimore) the pressure is five times that of the atmosphere. They obtain a regular rotary motion, without having occasion, as in Evans's engine, to make use of a regulator; but this advantage is partly counterbalanced by the inconvenience of not being able to make use of the expansive power of the steam, reduced by degrees to the lowest point before it escapes. The sixty-horse power engine fixed on board the Surprise burns twenty-two steres of wood in sixteen hours. It is said that during this time she travelled one hundred and twenty miles, and excelled in speed all the boats which were at Baltimore in 1817. The engine and boilers cost 66,000 francs for a sixty horse power, and 44,000 francs for a thirty-horse power; it is very simple, and may be fixed in much less room than Evans's engine.

After having noticed the respective advantages of these different engines, M. Manestier describes the different methods of fixing these engines on board the boats. He closes by several observations upon the construction and working of the boilers, which cannot fail to be of service to practical men.

The Americans have, for some years, made most of their boilers of copper for those engines which usually work with sea water, the deposit from which adheres less to copper than iron, and is more easily cleansed. It is, besides, more ductile. When the boats make long voyages, it is necessary to remove and replace the water in the boiler, by degrees, several times in the day, in order to prevent the sediment becoming too great and precipitating. If the passage does not exceed twenty-four hours, it is sufficient to clean out the boiler at the end of the voyage. In the course of this time a precipitate will be formed a millimetre and a half in thickness. "As this sediment is very hard, *they are able*," says the author, "by evaporating sea water, at a certain temperature, to obtain solid casts."*

In noticing the boats in the state of New York, M. Manestier has embodied an account of the great plan of internal navigation which the Americans are now endeavouring to carry into effect. New York is in the bottom of a large bay, at the extremity of an island in the river Hudson. In ascending to Albany from New York, forty-six locks lift the boats one hundred and twenty-eight metres above the Hudson. In travelling one hundred and eighty-two kilometres we come to Rome; after descending into the valley of the Tennessee we again ascend by means of twenty-five locks and two hundred and sixty-two kilometres from Tenessee, and enter Lake Erie, which is one hundred and seventy-one metres above the Hudson. The branches of a canal, formed by rivers rendered navigable, carry them to Lake Ontario, which is only divided from Lake Erie by the Great Fall of Niagara, which is not navigable. The basin of the Mississippi has an area six times larger than that of France. This river carries down a great deal of mud, and has very miry banks; its rise and fall are too great to have towing paths formed on its banks. The boats usually ascend the stream by means of oars, sometimes by hauling on board at a rope fastened to something on the shore. They are unable to advance more than fourteen or fifteen miles per day, notwithstanding the number of hands, and their great care to keep in that part of the stream where there is least current. It was supposed that the current of the Mississippi was three knots and a half per hour, whilst in reality its mean velocity is not more than two and a half. This error made it necessary that the steam-boats should have greater speed in order to ascend the stream. This mistake was favourable to the progress of the art, and caused those continued efforts to obtain the best-going boats. From 1811 Fulton well deserved the exclusive privilege which he had obtained from the state of Louisiana for navigating this river with steam-boats.

The boats employed in America are of several kinds. The greater number have two wheels, one on each side. Some have but one wheel placed abaft, similar to the boats which did actually navigate the Seine.†

* There appears a great ambiguity in this sentence. The deposit in the boilers of sea-going boats is not *always* compact, but frequently friable, owing, I presume, to the salt and sand held in the water.—*Translator.*

† I believe that I am correct in stating that this mode of management was proposed in America,

M. Manestier has given a list of the principal steam-boats which navigate the Mississippi and the rivers which run into it, accompanied with explanatory remarks as to each.

His memoirs contain also a description of various plans invented, but not yet carried into practice by the Americans, for supplying the action of oars by other mechanical means.

When M. Manestier has curtailed several tables of dimensions and technical details, which, although important to obtain, would be useful to engineers only, we think his memoirs will be well worthy of publication, and would render great service to a branch of maritime business in which we have at present made but little progress.

MEMOIR OF THE LIFE OF ELI WHITNEY. THE INVENTOR OF THE COTTON GIN.

[The invention of the gin for the clearing of cotton bears to the agricultural and manufacturing interests of the United States, nearly the same relation in point of importance, which that of the power loom does to the cotton manufactures of England. The inventor Eli Whitney, is justly regarded by the Americans as one of the greatest benefactors of their country, and his memory is cherished amongst them with the same sort of reverence which Englishmen do that of James Watt. On a trial which took place touching the originality of the invention, Judge Johnson remarked, "In short, if we should assert that the benefits of this invention exceed *one hundred millions of dollars*, we could prove the truth of the assertion by correct calculation." Whitney, like Watt, appears to have been no less distinguished for his mechanical genius than for great moral worth. For the materials of the following interesting and instructive account of him, as also for a portrait, which will be published with the Supplement to our present volume, we are indebted to the American Journal of Science.]

Eli Whitney was born in Westborough, Worcester county, Massachusetts, December 8, 1765. The paternal ancestors of Mr. Whitney emigrated from England among the early settlers of Massachusetts, and their descendants were among the most respectable farmers of Worcester county. His maternal ancestors, of the name of Fay, were also English emigrants, and ranked among the substantial yeomanry of Massachusetts. A family tradition respecting the occasion of their coming to this country may serve to illustrate the history of the times. The story is, that about two hundred years ago, the father of the family, who resided in England, a man of large property and great respectability, called together his five sons, and addressed them thus: "America is to be a great country; I am too old to emigrate to it myself; but if any one of you will go, I will give him a double share of my property." The youngest son instantly declared his willingness to go, and his brothers gave their consent. He soon set off for the New World, and landed at Boston, in the neighbourhood of which place he purchased a large tract of land, where he enjoyed the satisfaction of receiving two visits from his venerable father.

Indications of Eli's mechanical genius were developed at a very early age. Of his early passion for such employments his sister gives the following account. "Our father had a workshop, and sometimes made wheels of different kinds and chairs. He had a variety of tools, and a lathe for turning chair-posts. This gave my brother an opportunity of learning the use of tools when very young. He lost no time, but as soon as he could handle tools he was always making something in the shop, and seemed not to like working on the farm. On a time, after the death of our mother, when our father had been absent from home two or three days, on his return he inquired of the housekeeper what the boys had been doing? She told him what B. and J. had been about. But what has Eli been doing, said he. She replied, he had been making a fiddle. 'Ah!' (added he despondingly) 'I fear Eli will have to take his portion in fiddles.' He was at this time about twelve years old. His sister adds, that this fiddle was finished throughout, like a common violin, and made tolerably good music. It was examined by many persons, and all pronounced it to be a remarkable piece of work for such a boy to perform.

with a view to avoid those accidents to which the paddle-wheels were liable when placed at the sides, from snags and similar obstructions in the Mississippi. Snags are sunken trees, and sawyers, Capt. Hall tells us, are trees, one of whose ends are attached to the bottom of the river, whilst the other, which points down the stream, is buoyant. It is evident that these must be peculiarly dangerous to steam-vessels from the rapidity with which they ascend against a current.—*Translator.*

From this time he was employed to repair violins, and had many nice jobs, which were always executed to the entire satisfaction, and often to the astonishment of his customers. His father's watch being the greatest piece of mechanism that had yet presented itself to his observation, he was extremely desirous of examining its interior construction, but was not permitted to do so. One Sunday morning, observing that his father was going to meeting, and would leave at home the wonderful little machine, he immediately feigned illness as an apology for not going to church. As soon as the family were out of sight, he flew to the room where the watch hung, and taking it down, he was so delighted with its motions, that he took it all in pieces before he thought of the consequences of his rash deed; for his father was a stern parent, and punishment would have been the reward of his idle curiosity had the mischief been detected. He, however, put the work all so neatly together, that his father never discovered his audacity until he himself told him many years afterwards."

When Whitney was fifteen or sixteen years of age, he suggested to his father an enterprise which was an earnest of the similar undertakings in which he engaged on a far greater scale in later life. This being the time of the Revolutionary War, nails were in great demand, and bore a high price. At that period nails were made chiefly by hand, with little aid from machinery. Young Whitney proposed to his father to procure for him a few tools, and to permit him to set up the manufacture. His father consented, and he went steadily to work, and suffered nothing to divert him from his task, until his day's work was completed. By extraordinary diligence he gained time to make tools for his own use, and to put in knife blades, and to perform many other curious little jobs, which exceeded the skill of the country artisans. At this laborious occupation the enterprising boy wrought alone, with great success, and with much profit to his father, for two winters, pursuing the ordinary labours of the farm during the summers. At this time he devised a plan for enlarging his business and increasing his profits. He whispered his scheme to his sister, with strong injunctions of secrecy; and requesting leave of his father to go to a neighbouring town, without specifying his object, he set on horseback in quest of a fellow labourer. Not finding one so easily as he had anticipated, he proceeded from town to town, with a perseverance which was always a *strong trait of his character*, until at the *distance of forty miles* from home, he found such a workman as he desired. He also made his journey subservient to his improvement in mechanical skill, for he called at every work-shop on his way, and gleaned all the information he could respecting the mechanic art.

At the close of the war, the business of making nails was no longer profitable; but a fashion prevailing among the ladies of fastening on their bonnets with long pins, he contrived to make those with such skill and dexterity that he nearly monopolized the business, although he devoted to it only such seasons of leisure as he could redeem from the occupations of the farm, to which he now principally betook himself. He added to this article the manufacture of walking canes, which he made with peculiar neatness.

In respect to his proficiency in learning, while young, we are informed that he early manifested a fondness for figures, and an uncommon aptitude for arithmetical calculations, though in the other rudiments of education, he was not particularly distinguished. Yet at the age of fourteen, he had acquired so much general information, as to be regarded on this account, as well as on account of his mechanical skill, as a very remarkable boy.

From the age of nineteen, young Whitney conceived the idea of obtaining a liberal education; but being warmly opposed by his stepmother, he was unable to procure the decided consent of his father, until he had reached the age of twenty-three years. But, partly by the avails of his manual labour, and partly by teaching a village school, he had been so far able to surmount the obstacles thrown in his way, that he had prepared himself for the Freshman class in Yale College, which he entered in May, 1789. As we are soon to accompany Mr. Whitney beyond the sphere of his domestic relations, we may mention here that he finished his collegiate education with little expense to his father. His last college bills were indeed paid by him, but the money was considered as a loan, and for it the son gave his note, which he afterwards duly cancelled. After the decease of his father he took an active part in the settlement of his estate, but generously relinquished all his parsimony for the benefit of the other members of the family.

The propensity of Mr. Whitney to mechanical inventions and occupations, was frequently apparent during his residence at College. On a particular occasion, one of the tutors happening to mention some interesting philosophical experiment, regretted that he could not exhibit it to his pupils, because the apparatus was out of order, and must be sent abroad to be re-

paired. Mr. Whitney proposed to undertake this task, and performed it greatly to the satisfaction of the Faculty of the College.

A carpenter being at work upon one of the buildings of the gentleman with whom Mr. Whitney boarded, the latter begged permission to use his tools during the intervals of study; but the mechanic being a man of careful habits, was unwilling to trust them with a student, and it was only after the gentleman of the house had became responsible for all damages, that he would grant the permission. But Mr. Whitney had no sooner commenced his operations than the carpenter was surprised at his dexterity, and exclaimed, "there was one good mechanic spoiled when you went to college."

Soon after Mr. Whitney took his degree in the autumn of 1792, he entered into an engagement with a Mr. B. of Georgia, to reside in his family as a private teacher. Mr. Whitney had scarcely set his foot in Georgia, however, before he was met by a disappointment which was an earnest of that long series of adverse events which, with scarcely an exception, attended all his future negotiations in the same State. On his arrival he was informed that Mr. B. had employed another teacher, leaving Whitney entirely without resources, and without friends, except in the family of General Greene, of Mulberry Grove, near Savannah, with whom he had accidentally formed an acquaintance in his journey into Georgia. In these benevolent people, however, his case excited much interest, and Mrs. Greene kindly said to him, 'My young friend, you propose studying the law; make my house your home—your room, your castle, and there pursue what studies you please.' He accordingly commenced the study of the law under that hospitable roof.

Mrs. Greene was engaged in a piece of embroidery in which she employed a peculiar kind of frame called a *tambour*. She complained that it was badly constructed, and that it tore the delicate threads of her work. Mr. Whitney, eager for an opportunity to oblige his hostess, set himself at work, and speedily produced a tambour frame made on a plan entirely new, which he presented to her. Mrs. Greene and her family were greatly delighted with it, and thought it a wonderful proof of ingenuity.

Not long afterwards, a large party of gentlemen came from Augusta and the Upper county, to visit the family of General Greene, consisting principally of officers who had served under the General in the *Revolutionary army*. Among the number *were Major Bremen*, Major Forsyth, and *Major Pendleton*. They fell into conversation upon the state of agriculture among them, and expressed great regret that there was no means of cleaning the green seed cotton, or separating it from its seed, since all the lands which were unsuitable for the cultivation of rice, would yield large crops of cotton. But until ingenuity could devise some machine which would greatly facilitate the process of cleaning, it was in vain to think of raising cotton for market. Separating one pound of the clean staple from the seed was a day's work for a woman; but the time usually devoted to picking cotton was the evening, after the labour of the field was over. Then the slaves, men, women and children, were collected in circles with one, whose duty it was to rouse the dozing and quicken the indolent. While the company were engaged in this conversation, "Gentlemen," said Mrs. Greene, "apply to my young friend Mr. Whitney — he can make any thing." Upon which she conducted them into a neighbouring room, and and showed them her tambour frame, and number of toys which Mr. W. had made, or repaired for the children. She then introduced the gentlemen to Whitney himself, extolling his genius, and commending him to their friendship. He modestly disclaimed all pretensions to mechanical genius; and when they named their object, he replied that he had never seen cotton or cotton seed in his life. Mrs. G. said to one of the gentlemen "I have accomplished my aim. Mr. Whitney is a very deserving young man, and to bring him into notice was my object. The interest which our friends now feel for him, will, I hope, lead to his getting some employment to enable him to prosecute the study of the law."

But a new turn that no one of the company dreamed of, had been given to Mr. Whiney's views. It being out of season for cotton in the seed, he went to Savannah, and searched among the warehouses and boats, until he found a small parcel of it. This he carried home, and communicated his intentions to Mr. Miller, who warmly encouraged him, and assigned him a room, in the basement of the house, where he set himself at work with such rude materials and instruments as a Georgia plantation afforded. With these resources however, he made tools better suited to his purpose, and drew his own wire, (of which the teeth of the earliest gins were made,) an article which was not at that time to be found in the market of Savannah. Mrs. Greene and Mr. Miller were the only persons ever admitted to his workshop, and the only persons who knew in what way he was employing himself. The many hours he spent in his

mysterious pursuits, afforded matter of great curiosity and often of raillery to the younger members of the family. Near the close of the winter, the machine was so nearly completed as to leave no doubt of its success.

Mrs. Greene was eager to communicate to her numerous friends the knowledge of this important invention, peculiarly important at that time, because then the market was glutted with all those articles which were suited to the climate and soil of Georgia, and nothing could be found to give occupation to the negroes, and support to the white inhabitants. This opened suddenly to the planters boundless resources of wealth, and rendered the occupations of the slaves less unhealthy and laborious than they had been before.

Mrs. Greene, therefore, invited to her house gentlemen from different parts of the State, and on the first day after they had assembled, she conducted them to a temporary building, which had been erected for the machine, and they saw with astonishment and delight, that more cotton could be separated from the seed in one day, by the labour of a single hand, than could be done in the usual manner in the space of many months.

The individual, however, who contributed most to incite Whitney to persevere in the undertaking, was *Phineas Miller*, Esq. Mr. Miller was a native of Connecticut, and a graduate of Yale College. Like Mr. Whitney, soon after he had completed his education at college, he came to Georgia as a private teacher, in the family of General Greene, and after the decease of the General, he became the husband of Mrs. Greene. He had qualified himself for the profession of law, and was a gentleman of cultivated mind and superior talents; but he was of an ardent temperament, and therefore well fitted to enter with zeal into the views which the genius of his friend had laid open to him. He had also considerable funds at command, and proposed to Mr. Whitney to become his joint adventurer, and to be at the whole expense of maturing the invention until it should be patented. If the machine should succeed in its intended operation, the parties agreed, under legal formalities, "that the profits and advantages arising therefrom, as well as all privileges and emoluments to be derived from patenting, making, vending, and working the same, should be mutually and equally shared between them." This instrument bears date May 27, 1793, and immediately afterwards they commenced business under the firm of *Miller & Whitney*.

An invention so important to the agricultural interest (and, as it has proved, to every department of human industry,) could not long remain a secret. The knowledge of it soon spread through the State, and so great was the excitement on the subject, that multitudes of persons came from all quarters of the State to see the machine; but it was not deemed safe to gratify their curiosity until the patent right had been secured. But so determined were some of the populace to possess this treasure, that neither law nor justice could restrain them; they broke open the building by night, and carried off the machine. In this way the public became possessed of the invention; and before Mr. Whitney could complete his model and secure his patent, a number of machines were in successful operation, constructed with some slight deviation from the original, with the hope of evading the penalty for violating the patent right.

As soon as the co-partnership of Miller and Whitney was formed, Mr. Whitney repaired to Connecticut, where as far as possible, he was to perfect the machine, obtain a patent, and manufacture and ship for Georgia, such a number of machines, as would supply the demand.

His return to Georgia was, however, delayed until April. The importunity of Mr. Miller's letters written during the preceding period, urging him to come on, evinces how eager, the Georgia planters were to enter the new field of enterprise, which the genius of Whitney had laid open to them.

"Do not let a deficiency of money, do not let any thing (says Mr. Miller) hinder the speedy construction of the Gins. The people of the country are almost running mad for them, and much can be said to justify their importunity."

The general resort of the planters to the cultivation of cotton, and its consequent production in vast quantities, the value of which depended entirely upon the chance of getting it cleaned by the gin, created great uneasiness, which first displayed itself in this pressure upon Miller & Whitney, and afterwards afforded great encouragement to marauders upon the patent right, who were now becoming numerous and audacious.

The *roller gin*, was at first the most formidable competitor, with Whitney's Machine. It extricated the seeds by means of rollers, crushing them between revolving cylinders, instead of disengaging them by means of teeth. The fragments of seeds which remained in the cotton, rendered its execution much inferior in this respect to Whitney's Gin, and it was also much slower in its operation.

But a still more formidable rival appeared early in the year 1795, under the name of the *Saw Gin*. It was Whitney's gin, except that the teeth were cut in circular rims of iron, instead of being made of wires, as was the case in the earlier forms of the patent gin. The idea of such teeth had early occurred to Mr. Whitney, as he afterwards established by legal proof. But they would have been of no use except in connection with the other parts of his machine; and, therefore, this was a palpable attempt to evade the patent right, and it was principally in reference to this, that the lawsuits were afterwards held.

In March, 1795, in the midst of these perplexities and discouragements, Mr. Whitney went to New York on business, and was detained there three weeks by an attack of fever and ague, the seeds of which had been sown the previous season in Georgia. As soon as he was able to leave the house, he embarked on board a packet for New Haven. On his arrival at this place, he was suffering under one of those chills which precede the fever. As was usual on the arrival of the packet, people came on board to welcome their friends, and to exchange salutations, when Mr. Whitney was informed that, on the preceding day, his shop, with all his machines and papers, had been consumed by fire! Thus suddenly was he reduced to absolute bankruptcy, having debts to the amount of four thousand dollars, without any means of making payment. Mr. Whitney, however, had not a spirit to despond under difficulties and disappointments, but was aroused by them to still more vigorous efforts.

Mr. Miller also, on hearing of this catastrophe, manifested a kindred spirit. The letters written by Mr. Whitney on the occasion we have not been able to obtain; but the reply of Mr. Miller indicates what were the feelings of both parties. It may be of service to enterprising young men, who meet with misfortunes, to read an extract or two.

"I think with you (says Mr. M.), that we ought to meet such events with equanimity. We have been pursuing a valuable object by honourable means; and I trust that all our measures have been such as reason and virtue must justify. It has pleased Providence to postpone the attainment of this object. In the midst of the reflections which your story has suggested, and with feelings keenly awake to the heavy, the extensive injury we have sustained, I feel a secret joy and satisfaction that you possess a mind in this respect *similar* to my own—that you are not dis*heartened*—*that* you do not relinquish the pursuit—and that you will persevere and endeavour, at all events, to attain the main object. This is exactly consonant to my own determinations. I will devote all my time, all my thoughts, all my exertions, and all the money I can earn or borrow, to encompass and complete the business we have undertaken; and if fortune should, by any future disaster, deny us the boon we ask, we will at least deserve it. It shall never be said that we have lost an object which a little perseverance could have attained. I think, indeed, it will be very extraordinary, if two young men in the prime of life, with some share of ingenuity, with a little knowledge of the world, a great deal of industry, and a considerable command of property, should not be able to sustain such a stroke of misfortune as this, heavy as it is."

While struggling with these multiplied misfortunes, intelligence was received from England, which threatened to give a final blow to all their hopes. It was, that the English manufacturers condemned the cotton cleaned by their machines, on the ground that the staple was greatly injured.

At this time (1796) Miller and Whitney had thirty gins at eight different places in the state of Georgia, some of which were carried by horses or oxen, and some by water. A number of these were standing still for want of the means of supplying them. The company had also invested about 10,000 dollars in real estate, which was suited only to the purposes of ginning cotton. All things now conspired to threaten them with deep insolvency.

We have before us a letter written by Mr. Whitney, dated October 7th, 1797, from which it will be seen what was the state of his affairs, and of his feelings, at this period. "The extreme embarrassments (says he) which have been for a long time accumulating upon me, are now become so great that it will be impossible for me to struggle against them many days longer. It has required my utmost exertions to exist, without making the least progress in our business. I have laboured hard against the strong current of disappointment, which has been threatening to carry us down the cataract; but I have laboured with a shattered oar, and struggled in vain, unless some speedy relief is obtained."

However, brighter prospects seemed now to be opening upon them, from the more favourable reports that were made respecting the quality of their cotton. Respectable manufacturers, both at home and abroad, gave favourable certificates; and retailing merchants sought for the

cotton cleaned by Whitney's gin, because it was greatly preferred by their customers to any other in the market. This favourable turn in public opinion would have restored prosperity to the company, had not the encroachments on their patent right become so extensive as almost to annihilate its value.

In April, 1799, Mr. Miller writes as follows: "The prospect of making any thing by ginning in this State, is at an end. Surreptitious gins are erected in every part of the country; and the jurymen at Augusta have come to an understanding among themselves, that they will never give a cause in our favour, let the merits of the case be as they may."

Many of the planters of South Carolina having expressed an opinion that if an application were made to their legislature by the citizens to purchase the right of the patentees for that State, there was no doubt that it would be done to the satisfaction of all parties. Accordingly, Mr. Whitney repaired to Columbia, taking the city of Washington in his way, where he was furnished with very obliging letters from President Jefferson and Mr. Madison, then secretary of state; testimonials which, no doubt, were of great service to him in his subsequent negotiations. Soon after the opening of the session of the legislature in the month of December, 1801, the business was regularly brought before the legislature, and a joint committee of both Houses appointed to treat with the patentees.

We subjoin an extract of a letter addressed at this time by Mr. Whitney to his friend Stebbins, both as a statement of the particulars relating to the contract, and as evincive of the feelings of the writer.

"Columbia, South Carolina, Dec. 20, 1801.

"DEAR STEBBINS—I have been at this place a little more than two weeks, attending the legislature. They closed their session at ten o'clock last evening. A few hours previous to their adjournment, they voted to purchase, for the State of South Carolina, my patent right to the machine for cleaning cotton, at fifty thousand dollars, of which sum, twenty thousand is to be paid in hand, and the remainder in three annual payments of ten thousand dollars each. This is selling the right at a great sacrifice. If a regular course of law had been pursued, from two to three hundred thousand dollars would undoubtedly have been recovered. The use of the machine here is amazingly extensive, and the value of it beyond all calculation. It may, without exaggeration, be said to have raised the value of seven-eighths of all the three southern States from fifty to one hundred per cent. We get but a song for it in comparison with the worth of the thing; but it is securing something. It will enable Miller and Whitney to pay all their debts, and divide something between them. It establishes a precedent which will be valuable as it respects our collections in other States, and I think there is now a fair prospect that I shall in the event realize property enough to render me comfortable, and in some measure independent."

In December, 1802, Mr. Whitney negociated a sale of his patent right with the State of North Carolina. The legislature laid a tax of two shillings and sixpence upon every saw* employed in ginning cotton, to be continued for five years, which sum was to be collected by the sheriffs in the same manner as the public taxes; and after deducting the expenses of collection, the avails were faithfully paid over to the patentee. At that time the culture of cotton had made comparatively little progress in the State of North Carolina; but, in proportion to the amount of interest concerned, this compensation was regarded by Mr. Whitney as more liberal than that received from any other source.

While these encouraging prospects were rising in North Carolina, Mr. Goodrich, an agent of the company, was entering into a similar negociation with the State of Tennessee. The importance of the machine began to be universally acknowledged in that State, and various public meetings of the citizens were held, in which were adopted resolutions strongly in favour of a public contract with Miller and Whitney. Accordingly the legislature of Tennessee, at their session in 1804, passed an act laying a tax of thirty-seven cents and a half per annum on every saw for the period of four years.

But while a fairer day seemed dawning upon the company in this quarter, an unexpected and threatening cloud was rising in another. It was during Mr. Whitney's negociation with the legislature of North Carolina that he received intelligence that the legislature of South Carolina had annulled the contract made with Miller and Whitney the preceding year, had suspended payment of the balance (thirty thousand dollars) due them, and instituted a suit for the recovery of what had already been paid to them.

The ostensible causes of this extraordinary measure, adopted by the legislature of South Carolina, were a distrust of the validity of the patent right, and failure on the part of the patentees to perform

* Some of the gins had forty saws.

certain conditions agreed on in the contract. Great exertions had constantly been made in Georgia to impress the public with the notion that Mr. Whitney was not the original inventor of the cotton gin, somebody in Switzerland having conceived the idea of it before him, and, especially, that he was not entitled to the credit of the invention in its improved form, in which saws were used instead of wire teeth, inasmuch as his particular form of the machine was introduced by one Hodgin Holmes. It was on these grounds that the Governor of Georgia, in his message to the legislature of that State in 1803, urged the inexpediency of granting any thing to Miller and Whitney.

Popular feeling, stimulated by the most sordid motives, was now awakened throughout all the cotton-growing States. Tennessee followed the example of South Carolina in suspending the payment of the tax laid upon cotton gins, and a similar attempt was made at a subsequent session of the legislature of North Carolina, but it wholly failed, and the report of a committee, offering a resolution, that "the contract ought to be fulfilled with punctuality and good faith," was adopted by both branches of the legislature.

There were also high-minded men in South Carolina, who were indignant at the dishonourable measures adopted by their legislature of 1803, and their sentiments had impressed the community so favourably with regard to Mr. Whitney, that at the session of 1804, the legislature not only rescinded what the previous legislature had done, but signified their respect for Mr. Whitney by marked commendations.

At this time a new and unexpected responsibility devolved on Mr. Whitney, in consequence of the death of his partner, Mr. Miller, who died on the 7th December, 1803.

Mr. Whitney was now left alone to to contend singly against those difficulties which had for a series of years almost broken down the spirits of both the partners. But the favourable issue of the affairs of Mr. Whitney, in South Carolina during the subsequent year, and the generous receipts that he obtained from the avails of his contracts with North Carolina, relieved him from the embarrassments under which he had so long groaned, and made him in some degree independent. Still, no small portion of the funds thus collected in North and South Carolina was expended in carrying on the fruitless, endless, law suits in Georgia.

In the United States court, held in *Georgia in December*, 1807, Mr. Whitney *obtained a most important* judgment, in a suit brought against a trespasser of the name of Fort. It was on this trial that Judge Johnson gave the decision in his favour to which we have before alluded.

This favourable decision, however, did not put a final stop to aggression. At the next session of the United States court, two other actions were brought, and verdicts for damages gained of two thousand dollars in one case, and one thousand and five hundred dollars in the other.

The influence of these decisions, however, availed Mr. Whitney very little, for now the term of his patent right was nearly expired. More than sixty suits had been instituted in Georgia before a single decision on the merits of his claim was obtained, and at the period of this decision, thirteen years of his patent had expired.

In 1798, Mr. Whitney became deeply impressed with the uncertainty of all his hopes founded upon the cotton gin, notwithstanding their high promise, and he began to think seriously of devoting himself to some business in which superior ingenuity, seconded by uncommon industry, qualifications which he must have been conscious of possessing in no ordinary degree, would conduct him by a slow but sure route to a competent fortune; and we have always considered it indicative of a solid judgment, and a well balanced mind, that he did not, as is frequently the case with men of inventive genius, become so poisoned with the hopes of vast and sudden wealth as to be disqualified for making a reasonable provision for life, by the sober earnings of frugal industry.

The enterprise which he selected in accordance with these views was the manufacture of arms for the United States. He accordingly addressed a letter to the Hon. Oliver Wolcott, Secretary of the Treasury, and through his influence obtained a contract for ten thousand stand of arms, amounting (as the price of each musket was to be thirteen dollars and forty cents) to one hundred and thirty-four thousand dollars—an undertaking of great responsibility, considering the limited pecuniary resources of the undertaker. This contract was concluded on the 14th of January, 1798, and four thousand were to be delivered on or before the last day of September of the ensuing year, and the remaining six thousand within one year from that time; so that the whole contract was to be fulfilled within a little more than the period of two years; and for the due fulfilment of it, Mr. Whitney entered into bonds to the amount of thirty thousand dollars. He must have engaged in this undertaking resolved "to attempt great things," without stopping to weigh all the chances against him; for as yet the

works were all to be erected, the machinery to be made, and much of it to be invented; the raw materials were to be collected from different quarters, and the workmen themselves, almost without exception, were yet to learn the trade. Nor was it a business with which Mr. Whitney himself was particularly conversant. Mechanical invention, a sound judgment, and persevering industry, were all that he possessed, at first, for the accomplishment of an enterprise which was, at that time, probably greater than any man had ever undertaken in the State of Connecticut.

The site which Mr. Whitney had purchased for his works was at the foot of the celebrated precipice called East Rock, within two miles of New Haven. This spot (which is now called Whitneyville) is justly admired for the romantic beauty of its scenery. A waterfall of moderate extent afforded here the necessary power for propelling the machinery. In this pleasant retreat Mr. Whitney commenced his operations with the greatest zeal; but he soon became sensible of the multiplied difficulties which he had to contend with. A winter of uncommon severity set in early and suspended his labours; and when the spring returned, he found himself so little advanced that he foresaw that he should be utterly unable to deliver the four thousand muskets according to contract. At the end of the first year after the contract was made, instead of four thousand muskets, only five hundred were delivered, and it was eight years, instead of two, before the whole ten thousand were completed. The entire business relating to the contract was not closed until January, 1809, when (so liberally had the government made advances to the contractor) the final balance due to Mr. Whitney was only two thousand four hundred and fifty dollars.

In the year 1812, he entered into a new contract with the United States to manufacture for them fifteen thousand stand of arms; and, in the mean time, he executed a similar engagement (we know not how extensive) for the State of New York.

It should be remarked, that the utility of Mr. Whitney's labours during the period of his life which we have now been contemplating, was not limited to the particular business in which he was engaged. Many of the inventions which he made to facilitate the manufacture of muskets, were applicable to most other manufactures of iron and steel. To many of these they were soon extended, and became the nucleus around which other inventions clustered; and at the present time *some of them may* be recognised in almost every considerable workshop of that description in the United States.

In the year 1812, Mr. W. made application to congress for the renewal of his patent for the cotton gin. In his memorial, he presented a history of the struggles he had been forced to encounter in defence of his right, observing that he had been unable to obtain any decision on the merits of his claim until he had been *eleven years* in the law, and *thirteen years* of his patent term had expired. He set forth, that his invention had been a source of opulence to thousands of the citizens of the United States; that, as a labour-saving machine, it would enable one man to perform the work of a thousand men; and that it furnishes to the whole family of mankind, at a very cheap rate, the most essential article of their clothing. Hence, he humbly conceived himself entitled to a further remuneration from his country, and thought he ought to be admitted to a more liberal participation with his fellow-citizens in the benefits of his invention. Although so great advantages had been already experienced, and the prospect of future benefits was so promising, still, many of those whose interest had been most promoted, and the value of whose property had been most enhanced by this invention, had obstinately persisted in refusing to make any compensation to the inventor. The very men whose wealth had been acquired by the use of this machine, and who had grown rich beyond all former example, had combined their exertions to prevent the patentee from deriving any emolument from his invention. From that State in which he had first made, and where he had first introduced his machine, and which had derived the most signal benefits from it, he had received nothing; and from no state had he received the amount of *half a cent per pound* on the cotton cleaned with his machines in one year. Estimating the value of the labour of one man at twenty cents per day, the whole amount which had been received by him for his invention, was not equal to the value of the labour saved *in one hour* by his machines then in use in the United States.

Notwithstanding these cogent arguments, the application was rejected by congress. Some liberal-minded and enlightened men from the cotton districts favoured the petition; but a majority of the members from that section of the Union were warmly opposed to granting it.

In the midst of these fruitless efforts to secure to himself some portion of the advantages which so many of his fellow-citizens were reaping from his ingenuity,

his armory proceeded with a sure but steady pace, which bore him on to affluence. For the few following years he occupied himfelf principally in the concerns of his manufactory, inventing new kinds of machinery, and improving and perfecting the old.

In January, 1817, Mr. Whitney was married to Miss Henrietta F. Edwards, youngest daughter of the Hon. Pierpont Edwards, late Judge of the District Court for the State of Connecticut. The fond and quiet scenes of domestic life, after which he had long aspired, but from which he had been debarred by the embarrassed or unsettled state of his affairs, now spread before him in the fairest light. Four children, a son and three daughters, added, successively, fresh attractions to the family circle. Happy in his home, and easy in his fortune, with a measure of respectability among his fellow citizens and celebrity abroad, which might well satisfy an honourable ambition, he seemed to have in prospect, after a day of anxiety and toil, an evening unusually bright and serene.

In this uniform and happy tenor, he passed the five following years, when a formidable malady began to make its approaches, by a slow but hopeless progress, which at length terminated his life.

From the 12th of November, 1824, his sufferings became almost unremitted until the 8th of January, 1825, when he expired,—retaining his consciousness to the last, closing his own eyes, and making an effort to close his mouth.

In his person, Mr. Whitney was considerably above the ordinary size, of a dignified carriage, and of an open, manly, and agreeable countenance. His manners were conciliatory, and his whole appearance such as to inspire universal respect. Among his particular friends no man was more esteemed. Some of the earliest of his intimate associates were also among the latest. With one or two of the bosom friends of his youth he kept up a correspondence by letter for thirty years, with marks of continually increasing regard. His sense of honour was high, and his feelings of resentment and indignation occasionally strong. He could, however, be cool when his opponents were heated; and, though sometimes surprised by passion, yet the unparalleled trials of patience which he had sustained, did not render him petulant, nor did his strong sense of the injuries he had suffered in relation to the cotton gin, impair the natural serenity of his temper.

But the most remarkable trait in the *character of Mr. Whitney*, aside from his inventive powers, was his *perseverance*; and this is the more remarkable, because it is so common to find men of great powers of mechanical invention deficient in this quality. Nothing is more frequent than to see a man of the most fertile powers of invention run from one piece of mechanism to another, leaving the former half finished; or if he has completed any thing, it is usual to find him abandon it to others, too fickle to pursue the advantages he might reap from it, or too sensitive to struggle with the sordid and avaricious, who may seek to rob him of the profits of his invention.

It would be difficult to estimate the full value of Mr. Whitney's labours without going into a minuteness of detail inconsistent with our limits. Every cotton garment bears the impress of his genius, and the ships that transported it across the waters were the heralds of his fame, and the cities that have risen to opulence by the cotton trade must attribute no small share of their prosperity to the inventor of the cotton gin. We have before us the declaration of the late Mr. Fulton, that Arkwright, Watt and Whitney, (we would add Fulton to the number), were the three men who did most for mankind of any of their cotemporaries; and, in the sense in which he intended it, the remark is probably true.

The following observations of a distinguished scholar and statesman, elicited in consequence of a recent visit to the cemetery of New Haven, evince the estimation in which Mr. Whitney's name is held, by one who is fully capable of appreciating his merits. After alluding to the monument of Gen. Humphreys, who introduced the fine wooled sheep into the United States, the stranger remarks:—"But Whitney's monument perpetuates the name of a still greater public benefactor. His simple name would have been epitaph enough, with the addition perhaps of 'the Inventor of the cotton gin.' How few of the inscriptions in Westminster Abbey could be compared with that! Who is there that, like him, has given his country a machine—the product of his own skill, which has furnished a large part of its population, 'from childhood to age, with a lucrative employment; by which their debts have been paid off; their capitals increased; *their lands trebled in value.*' It may be said indeed that this belongs to the physical and material nature of man, and ought not to be compared with what has been done by the intellectual benefactors of mankind; the Miltons, the Shakspeares, and the Newtons. But is it quite certain that any thing short of the highest intellectual vigour — the

brightest genius—is sufficient to invent one of these extraordinary machines? Place a common mind before an oration of Cicero and a steam-engine, and it will despair of rivalling the latter as much as the former; and we can by no means be persuaded, that the peculiar aptitude for combining and applying the simple powers of mechanics, so as to produce these marvellous operations, does not imply a vivacity of the imagination, not inferior to that of the poet and the orator. And then, as to the effect on society, the machine, it is true, operates, in the first instance, on mere physical elements, to produce an accumulation and distribution of property. But do not all the arts of civilization follow in the train? and has not he who has trebled the value of land, created capital, rescued the population from the necessity of emigrating, and covered a waste with plenty—has not he done a service to the country of the highest moral and intellectual character? Prosperity is the parent of civilization, and all its refinements; and every family of prosperous citizens, added to the community, is an addition of so many thinking, inventing, moral and immortal natures." — *New England Magazine, Nov.* 1831.

On Mr. Whitney's tomb is the following inscription:—

ELI WHITNEY,
The inventor of the Cotton Gin.
Of useful science and arts, the efficient patron and improver.
In the social relations of life, a model of excellence.
While private affection weeps at his tomb, his country honours his memory.
Born December 8, 1765.—Died January 8, 1825.

SILVER VERSUS GOLD.

Commercial Science.—Analysis of Mr. Rothschild's Evidence.—Messrs. Baring's Loans to the United States.

During the last three years, the consolidation of the North and South American monetary standards of value has been repeatedly anticipated in this Journal.

On the 14th of July last, probably at the moment Mr. Rothschild was being examined by the House of Commons, the Legislature of the United States, raised the value of the English sovereign to 288 pence. Already have the Messrs. Baring entered into a contract with the State of Louisiana, for 7,000,000 dollars!

On the 9th of June, 1830, Mr. Alexander Baring, in seconding the motion of Mr. Matthias Attwood, assured the House of Commons that he, as a national creditor, was entitled to receive but 240 pence, for the pound sterling. Mr. Herries, then Master of the Mint—President of the Board of Trade—and who, as Commissary-in-Chief, was, throughout the war, specially encharged with the calculation of the foreign exchanges, angrily replied—that his brother *Millionnaire* was not competent to manage his own affairs—threatened to send for Dr. Burrowes, should Mr. Baring refuse to receive, in addition to every 240 pence, a "bonus," to be determined by the foreign price of gold. On the 14th of July, upon the ejectment of the Tariff, the Legislature of the United States, enacted, that the "bonus" shall be 20 per cent. or four shillings per pound sterling; to enable the manufacturers of the United States, to turn the English manufacturers out of the South American markets.

As we have repeatedly stated, the South American proportionate value of silver to gold is, as the English pound of 16 ounces of silver, to the English ounce *avoir-du-pois* of gold. Throughout the war the pound sterling was valued by the Bank of England, at four Spanish dollars. The average for the dollars, at *full* weight, being $16\frac{4}{9}$ per pound weight of 16 Spanish, or Portuguese, or 12 Chinese ounces. Then, taking the fineness of the dollar at, 900.

$16 \div 1\frac{4}{9} =$, e $60 \times 4 = 240$ pence. And as 1 pound of 16 ounces =

7,000 grains ×, 900 fineness : 16,000 pence :: the sovereign 122·274 ×, 9166 : 287.

The American expression is integral:

100 cents : 60 pence :: 480 : = 288 pence.

The consolidation of the monies, weights, and, we may add, measures, of North and South America, is a most important commercial, and, consequently, political, event.

It appears, from an advertisement, in *The Times*, of the 17th instant, that Messrs. Ferrere, Laffitte, and Co., of Paris, value the dollar, payable in London, at 51 pence; while Messrs. Baring receive, from the State of Louisiana ($288 \div 4$) 72 pence, for the same quantity of silver. We now come to the evidence of Mr. Rothschild:—

"Do you make any estimation of the par of exchange?—There is no par of exchange; it depends entirely upon what the

value of gold abroad is, and upon that principle you can only take the par."

"Then the par would be estimated, according to your estimation, by calculating the value of the currency of one country against the other, and adding thereto the premium there might be upon gold?—Yes."

"Does not an army always require gold in preference to silver, without any reference to their comparative values?—They do not care for the price; if they want it they will give any price for it, being more portable."

"Do you find that the former calculation of the estimated value between silver and gold has lost its proportion?—I think gold is higher than silver, because there is not so much importation of gold as silver."

It was a favourite expression of the Emperor Napoleon—"The crowing of a cock determines empires." The Emperor of Russia, the King of Prussia, and the Prince of Orange, are three fighting cocks, wearing steel spurs—who "do not care for the price of gold;" nor for Lord Liverpool's theory of a gold standard of value.

Sir Isaac Newton, Mr. Locke, Sir William Petty, Mr. Dubost, Messrs. Kruse, Ricardo, Marien, Corbaux, and all other foreign commercial writers, have invariably held it to be an indisputable principle of commercial science, that it is wholly impossible to calculate the exchanges between one country, whose monetary standard is gold, and another, whose monetary standard is silver.

The gold theory was started by Lord Liverpool's father. In 1816, Lord Liverpool adopted the maxim of Ferdinand of Spain—"*Como mi padre o nada.*" "I must be like my father, and nobody else." Though, as Mr. Baring disinterestedly maintains, the debts were contracted in silver; though, throughout the war, the pound sterling was valued, by the Bank of England, at four Spanish dollars; though the armies in Portugal, Spain, and the United States, were paid not in gold, but in Spanish dollars; though the West Indian, East Indian, and all other colonial property, was valued in silver; though, in all the foreign countries throughout the world, property was, and is, valued, as it had been in England in every period of her history, by a silver standard of value, the Premier Minister added, according to the calculation of the Legislature of the United States, *at least*, four shillings to every pound sterling, not only of the home debts, but also of all the colonial debts to the mother country; for no other human reason than that his Lordship must be like his father, and nobody else. The Earl of Liverpool, as we all know, never misapplied one shilling of the public money to his private emolument.

When in opposition, his Majesty's Ministers were strenuous advocates for the restoration of the ancient standard. The proposition has been opposed by Sir Robert Peel, upon the isolated *fact*, that it amounts to the difference between the English fixed price and the foreign *advancing* price of gold. The foreign money-lenders, absentee capitalists, civil, military, and diplomatic, and the smugglers, assert that the error which was committed in 1819, amounts to but four per cent. This error is imputed to Mr. Ricardo, who never filled an official situation. It is Mr. Herries, who was paid, and is pensioned, as Commissary-in-Chief, who is responsible to the public, for this allowedly gross miscalculation, which amounts not to 4, but to 6 per cent. That the price of gold has been *advancing* from the earliest periods, have we not practical proof? In the time of Charlemagne, the proportion was as 12 to 1; or, as the pound troy of silver to the ounce troy of gold. In 1600, the price had *advanced* to 934·5 shillings ÷62 = 15·0725. The formula, since 1819, is 934·5 ÷66 = 14·159. Then as 934·5 : 91349 × 62 :: 100 : = 6 per cent. Or, as it was intended, 66 shillings = 6½ per cent. nearly.

Sir Robert Peel has placed the question, for solution, upon this single issue, shall the debtors have the option of paying in silver? The option having been conceded, no debtor would exchange one pound of gold for either 14·159, or 15·0725 pounds of silver; the foreign price being 16. Lord Liverpool's theory, amounting to 20 per cent., has beggared the West Indian debtors. Mr. Manning, who, for years, represented the Bank of England, in the House of Commons, is well aware that 240 pence will not discharge a debt of 288 pence. The East Indian debtors are also called upon to pay, for every 240 pence of debt, to the mother country, 288 pence, together with whatever additional "bonus" it may please Mr. Rothschild's arbiters of ex-

changes, the Emperor of Russia, the King of Prussia, and the Prince of Orange, to *command*.

It is urged, in opposition to the restoration of a silver standard, that there are English "*capitalists*" engaged in commercial speculations, whose pecuniary transactions, amounting to from six to ten shillings a week, feel it extremely embarrassing "to pay their balance in silver;" and who, therefore, with the Emperor of Russia, the King of Prussia, and the Prince of Orange, "do not care for the price of gold; if they want it, they will give any price for it, being more portable." By this juggle, 20 per cent. is extracted from the wages of those poor men! With respect to silver, Mr. Rothschild is asked—

"Would silver regulate the exchanges precisely as gold?—Certainly: and in France, and on the continent more."

"Do you think that the value of silver is as little subject to variation as the value of gold?—SILVER HAS NO VARIATION; because there is a coinage of silver; so that there can be no great difference in silver, except at some times, when it is wanting by any European government for particular purposes."

This coinage of silver, to which Mr. Rothschild refers, is the American dollars, which are exported from South America and Mexico, as manufactured merchandise; and which is the only coin which circulates throughout North and South America, the Empire of China, the Russian Empire in Asia, Africa, the Mediterranean, and the European Peninsula; and which were circulated throughout the United Kingdom, during the war, disfigured as Bank tokens. It may, then, be presumed that the Spanish dollar would be received at "The Travellers' Club."

Those politicians, who assert that the currency has not been investigated, are quite at fault. For the last two years, the Committees of both Houses of Parliament, on the East India and China Trades, have investigated the currency question. As Mr. Rothschild asserts, there is no par of exchange; consequently, there is no measure for the property of the English Empire! Until a par of exchange be established, there can be no "free trade" to the East Indies, or China, or any other country.

It is asserted, that the Bank of England governs the exchanges. Now, despite of the Bank of England, the English Minister, at Paris, receives 12,000 sovereigns annually, which yield him 14,400 pounds of silver; and our Minister, at Washington, receives 288 pence for every 240 pence voted to him by the House of Commons. Despite of the Bank of England, also, the loans to South America, constituted the cause of the commercial panic in 1825. The North and South American monetary standards being consolidated, the next commercial panic will be the effect of loans to North America. The enactment of the American Legislature of the 14th of July, has rendered useless Mr. M'Culloch's "Commercial Dictionary," which had been published but a few months previous. The value of the sovereign being *advanced* 36 cents., the Messrs. Baring would have lost, by the "Commercial Dictionary," 36 cents. upon every sovereign transferred from the Bank of England to the State of Louisiana.

The English manufacturer, who imports a pound of gold, must exchange it for 14·159 pounds of silver; while the foreign manufacturer exchanges a pound of gold for, *at least*, 16 pounds of silver.

Having accounted for the poverty of wages, and profits, we return to Mr. Rothschild's evidence:—

"How were we paid for our goods during the Bank restriction, when we did not require gold?—The Bank paper was exactly like money; the exchange on Amsterdam went down at last to 8 guilders, and it is now at 12 guilders; the exchange was against this country 32 per cent."

"Did not that arise from an excess of circulation?—No; it arose from the great expenditure by the armies of this country; and likewise there were subsidies paid to foreign powers."

"Was it not owing to our foreign expenditure for warlike and other purposes, upon the continent, that our paper was so much depreciated?—Certainly; you had a great many payments to make upon the continent."

"Then your opinion is that it was not from excess of paper, but from foreign expenditure, that our paper, compared with gold, was so much at a discount?—Yes."

"Do you think the depreciation was 33 per cent?—I cannot say exactly."

It has been stated in this Journal, that the depreciation of, not the Bank paper,

but of the foreign value of silver was 33⅓ per cent. This, it will be observed, corresponds very closely with Mr. Rothschild's calculation.

The value of the pound sterling having been established in England, by the Bank of England, at the Spanish mint standard price: (viz.)

868 ounces × 480 troy grains ÷ 1,000 either dollars, or doblons of *average* weight = 416 grains 64. Then, as 7,000 grains : 10,000 decimal grains :: 416·64 = 595.2; or 59½ pence; (the remedy, or allowance of the mint, is ½d.) the expenditure of the army—where? In Spain—was not calculated, as may naturally be inferred, by the Spanish value of the pound sterling, which had been established, by the Bank of England, for the regulation of the foreign exchanges; but by Mr. Herries, who was charged with the foreign war expenditure, at 54 pence = 4½ duodecimal shillings. Then, as 4½ : 6 :: 100 : = 133⅓; Mr. Rothschild's calculation is 32 per cent. Mr. Rothschild is the best possible evidence to the fact, having been employed by Mr. Herries, throughout the war, to supply the army in Portugal, Spain, France, the United States, and Belgium, with gold and silver. The currency of those countries is decimal.

When Mr. Vansittart laid the foundation for Mr. Peel's Bill, by inducing the House of Commons to vote—that the *guinea* was worth but 21 shillings; the Chancellor of the Exchequer could not have been aware that the Commissariat Chieftain had added exactly one-third to the value of the *guinea*, as the House of Commons have reported to the public, upon the evidence of Mr. Rothschild. We have now, it may be presumed, done with the Guinea Trade.

Mr. Rothschild is partial (though his evidence is extremely impartial) to the present bank system. But, is not Mr. Rothschild aware, that by shuffling the bank cards, 1½ of every 5 stakes have been cheatingly won, and that from the feeblest class of the national creditors?

Is not Mr. Rothschild aware, that Mr. George Rose's plan of "saving banks," is but a beggarly copy of the Scotch system of banking?

The rate of discount being 4 per cent., is not every Scotch retail trader entitled to 3 per cent. interest upon a deposit of £5? *Then, does not* every industrious poor man in Scotland participate—largely participate—in the profits of the Scotch system of banking?

Is it not one of the benefits to be derived from a reformed House of Commons, that the representatives of the people may draw—or employ the Bank of England to draw—upon the revenue, bills of exchange (suppose for £5.) not payable either in gold or silver, but receivable in payment of revenue to the entire amount of the home expenditure?

The governor of the Bank of England was asked—"Mr. Palmer, did you ever hear, that in 1825 it was proposed to the Government of France, to take measures for stopping the Bank of England?"—"*I have heard such a report.*"

To conclude.—The two leading principles of commercial science, which have been contended for in this journal, have been established most indisputably.

1st.—The legislature of the United States have declared—*enacted* is the word—that the property of the world is valued by the English, or Spanish, or Portuguese standards of weight, which is *arbitrarily* to the Chinese standard, as 4 is to 3.

2nd.—The House of Commons have reported upon the evidence of Mr. Rothschild, that the entire expenditure of the army, employed in Portugal, Spain, France, the United States, Belgium, and France, was overcharged one-fourth.

T.

September 22.

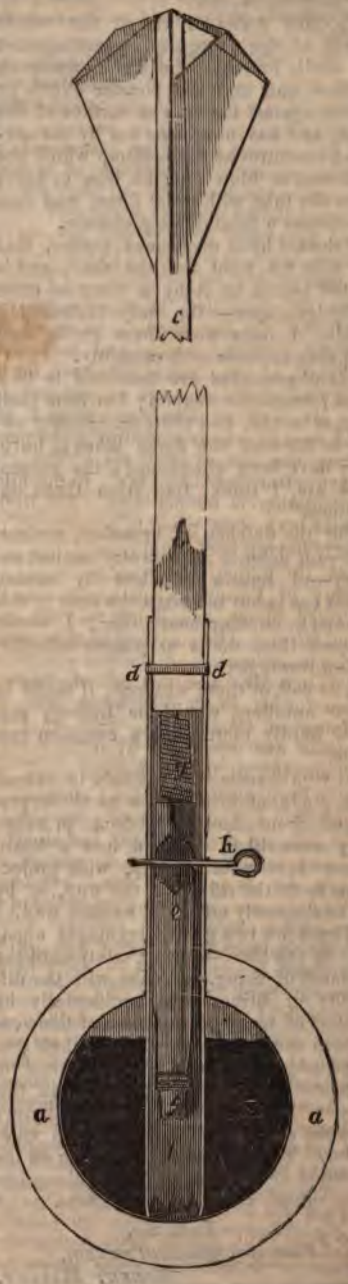
MALLET'S INSTANTANEOUS EXPLODING HAND GRENADE.

Sir,—I beg to transmit you a sketch of a spring, or hand grenade, intended to explode, on falling to the ground, or striking any hard object, against which it is hurled, of which I am the inventor.

Your readers are doubtless well aware that many modes have been suggested for firing shells, expelled from ordnance, by percussion, sudden compression of air, &c., and, hitherto, I believe, without success; but the idea of rendering grenades more effective, by enabling them to be used with safety, and fired with certainty, on the instant of their reaching their destination, is, I believe, comparatively novel. Two devices for effecting these desirable ends I have seen, by persons in this city; but one is

rendered useless by its enormous expense, and the complexity of its construction; and the other, from having external loose parts is incapable of enduring military carriage.

In reference to the accompanying sketch, it will be seen, that *a* is the section through the middle of a grenade (nearly at full size) cast of iron in the usual way; *b* is a short piece of common thin gas tubing (it may be of iron, but I recommend copper), into the remote extremity of which, the ash stick *c*, or guide tail of the grenade, is inserted, and secured by a cross wire *d*. The lower end of this tube is serrated, or nicked, and slightly tapered to permit a bit of silk tissue paper, which is glued over it, to pass into the aperture of the grenade. The use of this paper is to prevent the gunpowder in the shell from getting into the tube. Within this tube, loosely hangs a tapered cylinder of wrought or cast iron, *e*, on the extremity of which is secured a fulminating cap of tin foil, containing fulminate of mercury. This cylinder is suspended above the bottom of the tube, and at some distance from it by the spiral *g*, of fine wire, and is further secured from the possibility of danger by the cross wire, or bolt *h*, which is not removed until the grenade is about to be fired. It is not to be supposed that the wire spiral expands itself on the removal of the cross wire *h*, or that it acts in any wise as a spring, but merely as an expansible support. The upper extremity of the stick has four wings of very light tin, bent in such a way as to give a whirling motion to the grenade, and thus ensure its steady flight.



The mode of its explosion is obvious. When the bolt *h* is pulled out, and the grenade dropped from a height, or thrown from the hand, or a catapulta against an obstacle, the cylinder of iron *e*, retaining the motion that it has received after that of the grenade has been arrested will expand the wire spiral, and, striking against the bottom of the shell, the cap will detonate with more than sufficient force to burst the thin paper glued over the tube, and the powder in the shell will be fired.

It is evident that the wire spiral may be regulated to offer but a very slight resistance to the blow of the iron cylinder; *but to avoid trespassing on* your patience,

I shall not enter into any detail respecting proportions, &c.

In this grenade, almost the whole power of the charge is exerted against the shell, for the tube has no tendency to blow out, and the powder exerts its power against the convex surface of the tube, and has no escape but by the serrated apertures at the bottom, which are sufficient to blow out the iron cylinder from the tube with great force, and thus it becomes a formidable projectile.

I should have mentioned earlier, that the tube fits tight into the shell, and is pasted round to it by a piece of stout cartridge-paper — the only fastening it needs. I have tried these shells, and find they explode with certainty.

Hand grenades are admitted to be a most formidable weapon; but from their danger in use, and their uncertainty owing to the time the furze takes to burn, they have been abandoned; the present ones are, I think, free from these objections.

For the defence of breaches, ravines, &c.—for defence of infantry against cavalry—of houses attacked by armed bands (as is but too often the case in this country), on ship-board, &c., I would suppose these shells to possess considerable advantages.

The cost of these weapons, if made in large numbers, would be trifling, perhaps hardly more than a common grenade.

It would seem not difficult to extend this mode of firing shells to those projected from howitzers, &c., provided they were rifled, or fitted into a board paper hemispherical cup, with projections to fit the rifling of the gun, or by an analagously contrived wooden wad.

These are two great advantages apparent in this shell—perfect safety until the moment of firing, together with the difficulty of firing them accidentally by contact of igneous matter—and their explosion the instant they reach their destined object, thus leaving no time to escape. Large shells prepared in this way might be attached to Congreve rockets, or thrown from powerful catapulta. Thrown from the rigging on the crowded decks of ships laying alongside, their effects would be tremendous.

I am, Sir,
Your very obedient servant,
ROBERT MALLET.

94, Capel-street, Dublin.

MICROSCOPIC SCIENCE.

The " wonders of the microscope" have been at all times a popular theme with both learned and unlearned; but the capabilities of the instrument, as a help to the study of nature, can scarcely be said to have been sufficiently developed till within these few years, when it had the good fortune to engage the attention of Wollaston and Brewster, and of two individuals still more distinguished than either in this particular pursuit, Goring and Pritchard. Wollaston gave to the science of microscopic observation his compound magnifier and illuminator—the former being by far the greatest improvement in the combination of positive lenses ever effected. Brewster was the first who introduced the use of lenses made of gems, by which the powers of the single microscope have been increased at least twofold. To Goring we owe the first *effective* achromatic object-glasses for microscopes; to Pritchard, the first diamond-magnifier, which carried the application of gems to its highest perfection; and to the two latter gentlemen many other inventions and improvements of great value to microscopic science. Dr. Goring and Mr. Pritchard are also the joint authors of the " Microscopic Illustrations," a work which has not only served, by its " popular and diverting" character, to raise the microscope into higher favour than ever with the public, but has given an extension and accuracy to our knowledge of the *little* world little dreamt of by older investigators. To the " Microscopic Illustrations" these gentlemen have now added the " Mieroscopic Cabinet;"* and a third work " by the same" is announced as on the way, entitled " The Micrographia, or, The Natural History of several very Curious and Beautiful Minute Animals," &c.

The " Microscopic Cabinet," to which we now propose to limit our attention, opens with this very " sufficient reason" for its appearance:—

" While almost ev ry part of nature has within the last few years been explored, and our knowledge augmented, the living objects described in this work have

* The Microscopic Cabinet, or Select Animated Objects; with a Description of the Jewelled and Doublet Microscope, Test-Objects, &c. By Andrew Pritchard. To which are subjoined, Memoirs on the Verification of Microscopic Phenomena, and An Exact Method of Ascertaining the Quality of Microscopes and Engiscopes; by C. R. Goring, M.D. Whittaker and Co. 1832.

been nearly overlooked by naturalists; and such representations as we possess of them are delineated in the most incorrect and grotesque manner that can well be conceived."—*Preface.*

The "living objects" alluded to are the "Aquatic larvæ of Insects, Crustacea and Animalcules" and assuming that Mr. Pritchard's representations of them are as correct as they are beautiful, we must confess that all we knew of them before was as unlike the reality as darkness is to light. One thing about this tribe is very remarkable, namely, that the minuter they are, the part which the mechanical powers play in their system of being is only the more decided and manifest. We select an example or two:—

The larvæ of the libellula or dragon-fly.—"They possess a curious hydraulic apparatus, which they employ for propelling themselves and also for respiration. This apparatus, which forms the cavity of the lower part of the abdomen, it can dilate or contract at pleasure. When closed by the muscular action of the larvæ, the water with which it was previously filled is expelled, and by its action against the stationary fluid the creature is urged forward; when again dilated a fresh portion of water is admitted, and the pumping is repeated at the will of the creature." P. 35.

The small notonecta or boat-fly.—"The body of this insect is fringed with long hair on each side, and down the middle of the abdomen are disposed thick rows of the same. In the larger species they are very perceptible; their office appears to be that of buoying the insect on the surface of the water without requiring any muscular exertion, which is performed in this manner:—The insect rises to the surface, and elevates the inferior extremity of the body. Then lifting up the side rows of hair, it permits a portion of air to enter the channel which they previously occupied, and there retains it. When it wishes to sink, I observe, that it strikes down the fringe with the feet and thus liberates the air, by which means their bodies becoming specifically heavier, they descend. The contemplation of contrivances such as this so admirably calculated to effect their intended end, must surely elicit the highest admiration of the works of the Creator, even from the most obtuse and thoughtless. Many fish possess an air-vessel, which through the aid of proper muscles they have the power of compressing or dilating to facilitate the ascent or descent. In these insects the same purpose is effected by the simple law of *capillary attraction only.*" P. 47.

The descriptions of these living objects are followed by a chapter on Jewelled Microscopes, in which Mr. Pritchard gives the following interesting account of his diamond lens experiments:—

"Dr. Goring forwarded me a small brilliant diamond to begin upon, and it was proposed to give it the curves that in glass would produce a lens of a twentieth of an inch focus with the proportion of the radii of their surfaces as two to five. This stone I ground with the proper curves, and polished the flatter side contrary to the expectations of many whose judgment in these matters was thought of much weight, who predicted that the crystalline structure of the diamond would not permit it to receive a spherical figure. When thus far advanced fate decreed that I should lose the stone, and my only consolation was to discover afterwards that had it been completed, its thickness and enormous refractive power would probably have caused the focus to fall within the substance of the stone. Having, however, in this experiment proved the possibility of working lenses of adamant, I set about another, and selected a rose-cut diamond, in order to form it into a plano convex lens, and thereby save a moiety of the labour. In the progress of working this stone the heat generated by friction in the course of the abrasion of the diamond was perpetually melting the cement (shell-lac), by which the flat-side was affixed to the tool, and compelled me to seek some means by which it might be prevented. After several trials I found that when a portion of finely-powdered pumice-stone was mixed with the shell-lac the cement was much stronger, and less liable to melt than any other similar substance. On the 1st December, 1824, I had the pleasure of first looking through a diamond microscope, and it was doubtless the first time this precious gem had been employed in making manifest the hidden secrets of nature. A few days after, I had polished it sufficiently to put it into the hands of Dr. Goring, who tried its performance on various subjects, both as a single microscope and as the objective of a compound. He states, in a letter addressed to me, dated 3d January, 1825, 'that it has shown the most difficult transparent objects I have submitted to it:' and, again, 'I can clearly perceive the amazing superiority it will possess when completely finished.' I must, however, inform my readers that we discovered in this state various flaws in the stone: in consequence of which we abandoned all thoughts of completing it. In this condition the project remained for about a year, when I determined to resume my attempts, and having worked several

stones into lenses, and at last succeeded in obtaining a perfect one. In the course of these labours a new though not unexpected defect appeared in several lenses which would have subverted the whole scheme had the first diamond lens been free from it. These lenses, instead of giving a single image like the first, gave a double or triple one. This rendered them utterly useless as magnifiers, and made the defects of soft and hard parts in the same stone, and the small cavities in others, of comparatively trifling consequence. The images exhibited in such lenses overlapped each other, but were never entirely separated, though the quantity of overlapping varied in different specimens. It was now evident that these defects arose from polarization, though this stone is described as 'refracting single.' (Dr. Ure's Dict. Chemistry.) I subsequently learnt from Dr. Brewster, after I had overcame these obstacles, that this property of the diamond had been observed by him, and an account of it given in the Edinburgh Philosophical Transactions. On referring to his paper it appears Dr. B. found that some stones polarized in particular parts, while other portions of the same stone were quite free from any trace of polarity, and thus perfectly adapted to our purpose as had previously been demonstrated in the first diamond lens. Notwithstanding these difficulties and the consequent expense and labour they entailed on one before sufficiently experienced in working upon this refractory material with certainty, I have now the satisfaction of being able, by inspection *a priori* to decide whether a diamond is fit for a magnifier or not, and have now executed two plano-convex magnifiers of adamant whose structure is quite perfect for microscopic purposes. One of these is above the twentieth of an inch in focus, and is now in the possession of His Grace the Duke of Buckingham; the other in my hands, is the thirtieth of an inch focus, and consequently has amplification enough for most practical purposes." Pages 107. 111.

The advantages of the diamond lens are all of the very highest order. It has only one-ninth of the actual aberration of a glass lens of the same power and aperture, possesses nearly thrice the magnifying power, and suffers no deterioration in the course of time. On this last point there is a curious anecdote related:—

"It is well known, that the surface of glass lenses, undergoes a certain decomposition in the course of time, and thus loses its polish, to say nothing of the mechanical injuries of which it is susceptible; thus glass magnifiers seldom last a lifetime. If it is thought necessary to construct spectacles of pebbles to prevent these inconveniences; it will surely be admitted that delicate magnifiers of high powers ought to be placed on the same footing, or we shall have no means of verifying the observations of a former age under the same instrument. This was fully exemplified with Lewenhock's microscopes in the possession of the Royal Society, which Mr. Baker found so damaged as to be utterly useless soon after they became its property. Had they been made of the precious stones future generations might have confirmed his discoveries, or shown from what cause his observations were fallacious." P. 123.

Other gems possess, though in an inferior degree, the same microscopic properties as the diamond, such as the ruby, sapphire, garnet, &c. Mr. Pritchard describes a "new jewel and doublet microscope," which he has recently invented, and speaks of it with justice as one of the most simple yet efficient instruments of the kind ever invented:—"It is capable of being used in every possible direction, and the objects admit of almost every species of illumination. There is no screwing or unscrewing of apparatus; and the objects, magnifiers, and illuminators, can each or all be changed with facility and speed." The most remarkable feature in this microscope is a new mode of adjusting the magnifiers, in which the advantages of the screw, and rack and pinion, adjustments, are combined, free from that drop or *back-lash*, as it is called, which occurs when the screw or pinion turns round a certain portion before it comes into play:—

"It consists in employing a fine screw, kept up to its bearing by means of a steel spiral spring for the delicate adjustment, while the whole being connected with a tube sliding within the stem of the microscope, allows of a convex adjustment; the friction between the tubes exceeds that of the triangular bar, and holds them stationary, while the fine adjustment is effected by the screw; so that either or both adjustments may be made without the assistance of a pricking-screw, or throwing it in or out of gear." P. 126.

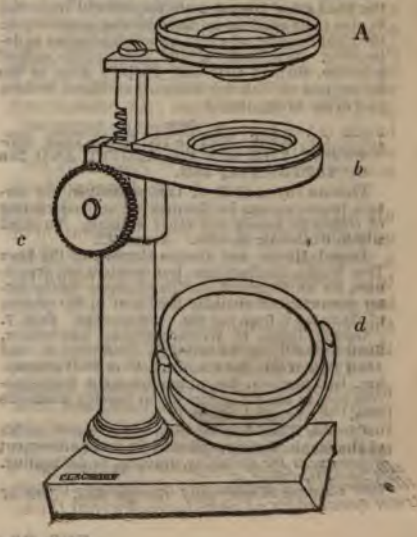
Without the aid, however, of Test-Objects for determining the specific qualities of microscopes, a person would be liable to great deception with even the best-constructed jewelled instrument. One may have great penetration, and yet be very deficient in defining power, and *vice versa*. As a telescope with a large aperture will frequently resolve clusters of stars and exhibit nebulæ

while it will fail in defining the disc of a planet, or even the moon, with precision; so, in like manner, a microscope, with a large aperture and high power, will show the active molecules and lined objects, while it will not define a leaf of moss or a mouse-hair. The advantage of a carefully-selected set of Test-Objects therefore is, that they serve as standards by which the peculiar capabilities of every instrument may be at once ascertained. Mr. Pritchard's account of the tests held in greatest repute is the only complete one which has yet appeared; and is followed by an admirable memoir by Dr. Goring, on the method of making use of them, for the verification of the powers of microscopes and engiscopes.* The value of this memoir will be duly appreciated by the reader, when he is informed that the method which it discloses has been for some time "a secret known only to a very few persons, and that no perfect achromatic microscope can be produced without it." Dr. Goring admits that the test objects by themselves afford "to the *public at large*, by far the *best* means of scrutinizing the verifications of microscopes and engiscopes," that is the best means to ordinary observers, "when genuine, and used fairly, without trick or fraud;" but he says they have been "shamefully abused, owing to the various facilities of resolution which exist between different specimens of lined objects, the external characters of which closely resemble each other, so that it may be said, *there are proof objects to suit the capacities of all sorts of microscopes!*" "If I may be allowed the expression," he adds, "the one mode drives the nail to the hilt, and the other clenches it; I therefore do not destroy but confirm the first method."

Dr. Goring has contributed another valuable memoir, "on the Verification of Microscopic Phenonema." His worthy associate Mr. Pritchard, describes it as containing "the sum and substance of microscopic science," all that is "essential to a practical knowledge of the subject;" and we see no reason to dissent from the opinion he has pronounced of its merits. It is full of very curious matter and written in a clear and engaging style.

The work concludes with a chapter of "Miscellaneous fragments," by Mr. Pritchard, one of which giving an account of a very ingenious pocket microscope of his invention, we shall take leave to transfer at length to our pages.

"*A new Pocket Microscope.*—Portability is a quality so essential in the opinion of many persons that I have been induced to construct a small instrument for their use, which at the same time should be more consistent in its principles than those in common use, and I believe will be found much more simple and equally useful. In similar instruments before the public, to render them portable, they separate into two or more pieces; this is obviated in my construction by the bar running within a tubular stem. Another objection to the common ones is that in using high powers the illumination is more feeble than with low powers; but it must be evident that the reverse ought to be obtained, for the more we amplify an object the darker it becomes. In their construction they remove the object further from the light, the higher the magnifying power; in mine the magnifier is brought to the light, the object being stationary. The bar is triangular, and therefore less liable to shake and loosen than square ones. A rough sketch of the microscope with the triangular bar partly drawn out to show the rack is here given.



* "Microscopes are formed into two grand divisions; first, those in which we look at the object *itself*, as single microscopes, doublets, and other compound magnifiers; and, secondly, those instruments in which we view a magnified *image* of the object, and not the object itself, commonly called compound microscopes: but as the term compound is equally applicable to doublets, &c., they being composed of two lenses, and as the latter instruments operate on a principle distinct from the former, those which exhibit an *image* of the object are termed *engiscopes*, whether reflectors or refractors, *and the other microscopes*."—Mr. Pritchard, p. 102.

A are two magnifiers, of which there are four; they fit by a spring into the arm at the top of the bar. These magnifiers are adjusted to the object placed on the stage *b* by the milled lead *c* of the pinion, and the light is directed through it by the mirror *d*, which can be turned about in any direction, and fits into the stand or block *e*. When the bar is lowered and the magnifiers taken out of the arm, the instrument, which is now only two inches and a quarter long, fits into a case (about the size of a snuff-box) one inch and three quarters wide by one inch deep (inside measure); the four magnifiers, packing between the stage and mirrors, do not occupy any extra space. P. 242.

The "Microscopic Cabinet," is a work which does altogether infinite credit to its authors; and is certainly by far the most valuable contribution which has been made to microscopic science in modern times.

The Comet.—(From the *Times*)—The periodical comet discovered on the 27th February, 1826, by Biela, which performs its revolution round the sun in about six years and three quarters, and whose return in the present year has been made the subject of elaborate calculation by mathematicians of the first eminence, has not disappointed the expectations of astronomers. It is already visible in superior telescopes, and may be expected shortly to be seen in its approach to the sun, if not by the naked eye, at least with instruments of moderate power. Its place this morning, before sun-rise, was about a degree and a half to the south west of the star Theta, in the constellation of Auriga; and its actual course is directed nearly towards the star of the same name in the constellation of Gemini; but its motion is rapid, and it will speedily assume a more southern direction.—*Slough, Monday, Sept. 24.*

Bridges.—The architectural correspondents of the Mechanics' Magazine are respectfully requested to give their opinions on the following question, on the right decision of which a considerable bet is depending. Are the dry or land-arches at the ends of a bridge, such as that near Pedlar's Acre, at the Surrey end of Waterloo Bridge, considered to form part of the bridge itself?

LIST OF NEW PATENTS GRANTED BETWEEN THE 20TH OF AUGUST AND 22D OF SEPTEMBER, 1832.

William Joyce, of Bow, harness-maker, for certain improvements in the making or constructing of collars for horses and other animals. To inroll within 6 calendar months. August 22.

Daniel Horton and George Horton, of the Leys Iron Works, Staffordshire, iron-masters and copartners, for an improved puddling-furnace for the better production of manufactured iron in the process of obtaining it from the pig. Six months. Sept. 7.

George Jones, of Wolverhampton, iron-master, James Foster, of Stourbridge, iron-master, and John Barker and John Jones, both of Wolverhampton, iron-masters, for an improvement in the process now in use for producing or making malleable iron. Six months. Sept. 8.

Caroline Eliza Ann Burgess, of Beauport, parish of Hollington, Sussex, spinster, for an improvement *or apparatus for sketching*, drawing, or delineating. *Six months. Sept. 8.*

John Osborne Mosley and George Bell, both of Primrose-hill, Salisbury-square, London, dye-sinkers and embossers, for an improvement in the making or manufacturing of pill and other boxes from pasteboard, paper, or other materials, which improvements are applicable to other purposes. Six months. Sept. 8.

Nicholas Troughton, of Swansea, copper-smelter, for an improvement or improvements in preparing the materials for, and in producing a cement applicable to, building and other purposes, which he denominates metallic cement. Two months. Sept. 8.

Pierre Frederic Fischer, of Chester-place, Regent's-park, gentleman, for certain improvements in piano-fortes, communicated to him by a certain foreigner residing abroad. Six months. Sept. 8.

John Brown, of Heaton Norris, cotton-manufacturer, and Thomas Heys, of the same place, bookkeeper, for an improvement in the machinery used for spinning cotton, silk, flax, and other fibrous substances, commonly called throstles. Two months. September 8.

Richard Badnall, the younger, formerly of Ashenhurst-hall, now of Douglas, in the Isle of Man, gent., for an improvement in the construction or formation of the frames, or rails, or lines of rail, or tramroads, upon which locomotive-engines shall or may work. Six months. September 8.

Richard Whytock, of Edinburgh, for an improved method or manufacture, which facilitates the production of regular figures, or patterns, on different fabrics, particularly velvet, velvet pile, and Brussels, Wilton, and Turkey carpets. Six months. September 8.

Richard Trevithick, of Camborne, engineer, for an improvement or improvements on the steam-engine, and in the application of steam power to navigation, and to locomotion. Six months. September 22.

John Howard Kyan, of Gillingham-street, Pimlico, Esq., for an improved mode of preserving paper, canvass, cloth, and cordage, for ships, and other uses, and the raw materials of hemp, flax, or cotton, from which the same may wholly or in part be made. Six months. September 22.

Joseph Gibbs, of the Kent-road, engineer, and Augustus Applegath, of Crayford, calico-printers, for improvements in machinery for cutting out wood for carriage-wheels, and for cutting and shaping the wheels. Two months. September 22.

INTERIM NOTICES.

The Supplement to Vol. XVII., containing Title Page, Preface, and Index, with a Portrait on Steel of Eli Whitney, the Inventor of the Cotton Gin, will be published on the 1st of November; also Vol. XVII. complete, price, in boards, 8s.

Communications received from Mr. Symington—J. M.—E. G.—Trebor Valentine—Mr. Twells—F. F.

Erratum.—The reviewer of Dr. Lardner's Lectures on the Steam Engine (No. 475) begs to apologise for a mistake which he has made in stating that "in the Novelty there was no bellows." In the Novelty, as he saw it some time after the Competition of 1829, there was, indeed, no bellows—the combustion being then promoted by means of an exhauster or fanner; but it appears that it had, in the first instance, a bellows, as represented in one of Dr. L.'s cuts of the engine, though not in the other. —*London, Sept.* 20, 1832.

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END OF VOL. XVII.

INDEX

TO

THE SEVENTEENTH VOLUME.

A.

Accounts, keeping, 368
African expedition, new, 371
Agriculture, Italian, 255
Air, transmission of, through tubes in a compressed state, 224, 318
—— carriage, Fordham's, 224
—— expulsion of, from pipes, 368
—— hot, blast, 272
—— inflammable, localities of, in coal mines, 121
—— pump, improved double barrel, 66
Airy, Professor, report by, on practical and physical astronomy, 205
Alchemists, Indian, 411
Alcohol, maximum weight of, 188
———— rectification of, 397
America, British, Macgregor's account of, 4
———— education in, 48
———— progress of steam navigation in, 100, 421
American carpenter's plane, 150
———— and English settlers, 199, 256, 298
———— rifles, 32, 179
———— silk, 298
———— statistics, 166
Andrews', (Dr.), oil gas lamp, 296
Animal food, consumption of, in London and Paris, 75
Anti-sediment, 416
Archery, 144, 160, 223
Archimedes, tomb of, 76
Architectural drawing, friendly to morals, 283
———————— quackery, 398
Architecture, Loudon's Encyclopedia of Cottage, &c., 82, 240, 280
————————, improvement of, 316, 344, 414
————————, naval, 188, 261, 297, 320
Arcs, gradation of circular, 185
Argand gas burner, Taylor's improved, 177
Arming press, imperial, 337
Artesian wells, 212
Ashmolean society, 209, 227
Asparagus-beds, cotton, 224
Astronomical society, 208
Atlas, family cabinet, 363
Atmosphere, height of the, 221
Audit, boards of, 32, 63
Audubonian, 23, 78, 291, 406
Aurora borealis, 175
Australia, temporary cottage for, 97
———— machinery in, 128

B.

Baarn, carpet manufactory at, 12
Babbage, Mr., and his calculating machine, 114, 144, 256; speech at the British Scientific Association, 209, 231; "Economy of Machinery and Manufactures," 213
Baddeley, Mr. William; method of transferring prints from paper to wood, 55; on street-paving, 77; on the nature of comets, 117, 157; on the oblique pen, 138; on drawing papers and boards, 262; Crosby-place, and the Gresham lectures, 267; oiling machinery, 277; imperial arming press, 338; India rubber balls, 419
Balance, accurate, 333
Balloon, spontaneous combustion of a, 272
Barker's mill compared with the overshot water-wheel, 27
Barlow's mode of rectifying the influence of local attractions on the needle, 339
Bat, maternal affection of the, 304
Baths, hot air, 47
————, vapour, 47, 202
————, sulphur, 137
Bayley's plan for constructing steam vessels, 113
Beamish's new mode of constructing vessels, 320
Beds, cholera or sweating, 202
Bees, working, 400
Beet-root paper, 367
Bell-casting, art of, 108, 372
Bell's submarine adventures, 365
Berzelius, 8, 47
Birmingham and London steam carriage company, 190, 256
———————— and London railway, advantages of, 360, 367
Black colours, 112
Blackfriars' Bridge, 400
Blaenavon iron works, inclined planes at, 149
Blast lamp, 314
Blasting rocks by galvanism, 266
Blow-pipe, economical, 30
————————, Hemming's safety, 210
Blue, how to make, for artists from indigo, 320
Boards of audit, 32, 63
————, drawing, 262
Boat propelling experiment, 21
Boats, steam, new claimant to their introduction, 260
Boiler, Baske and Company's, 22, 28

Boiler, safety plates, 111, 272
———, steam, deposits, 144, 416
Boilers, explosions of, 111, 191
———, mode of regulating the supply of, 22
Booth, Mr. Ab., on Wettersdett's metallic sheathing, 381; obtaining pure sugar from the cane juice, 283; the chemical characters of contagion, 408
Boring for water, 62
Bow-strings, 160
Bows, wood for, 144
Brain of Cuvier, 144
Braithwaite's steam fire engine, 127
Bramah's pump, application of, to the eradication of stumps of trees, 184
Bread, consumption of, in London and Paris, 74
Brewster, Sir David, 209
Brick tax, 344
Bridge, Hull Suspension, 198
Bridges, question on, 448
"British America," Macgregor's, 4
British Association, for the advancement of science, 167, 206, 227
Bronze, Chantrey's mode of taking casts of plants in, 216
Brougham, Lord, 192
Brown's gas vacuum engine, 273, 300, 326, 366
———————————, application of, to the process of boiling of sugar in vacuo, 315
Brunell, Mr., and the Thames Tunnel, 227
Buckland, Rev. Dr., Geology and the British Association, 205, 229
Budding's grass-shearing machine, 345
Busby's patent heating apparatus, 251, 320, 336
Buske and Co.'s new steam boiler, 22, 48

C.

Cajeput oil, 217
Calculating machine, Babbage's, 114, 144, 256
———— rule, Woollgar's pocket, 91
Caloric from water, 320
Cambridge Philosophical Society, 208
Canadas, the, and emigration to, 4, 93, 130, 142
Canal from the Nile to the Red Sea, 142
Canals and Railways, 396, 415
Candles brightest in a cluster, 142
Canning's life raft, 369
Caoutchouc, perfect solvent for, 368
Carpenter's plane, American, 150
Carpet manufactory at Baarn, 12
Carriages, steam, Hancock's, 49; Macerone, and Squire's, 383
Carriages, Mason's improvements in locking the fore wheels of, 225
Carriages, pedomotive, 48, 80
Carter's iron roofing, 181
Catenary curve, application of, to naval architecture, 297
Cattle, railroad conveyance of, 400
Cellar steps, improved, 249
Centrifugal action, 263
Chabert again, 304
Chain cables, English and American, 304
Chalybeate water, how to manufacture, 143
Chantrey's mode of taking casts of plants in bronze, 216
Chaptal, death of, 367
Character, value of, in commercial dealings, 217
Cheltenham in London, 143
Chimneys, smoky, cure of, 316, 358, 414
Chirodrome, or locomotive carriage of Ruthven, 256
Chitni, receipt for making, 37
Cholera sweating beds, 202
Church pews, 183, 290
Circle, quadrature of, 96
Circles, area of, 176
Circular arcs, graduation of, 185
Cleopatra's needle, 141
Clock, simple, 25
———, vocal, 283
Clocks, illumination of church, 105, 190, 220, 259
Cloth, new, 192
Coal-mine explosions, 41, 85, 121, 175, 264, 329, 352
———— machinery, 321
Coffin cranes, 96
Colonial lands, value of, 76
Colonization companies, 141
Colour mixers, hint to, 368
Colours, water, 262
———, black, 112
Comets, 75, 99, 117, 133, 157, 169, 268, 304, 384, 448
——— twenty ducats for one, 48
"Commercial Dictionary," M'Culloch's, 235
———— —— science, 51, 76, 183, 375
Congelation, effects of, 60
Consumption of bread and animal food in London and Paris, 74
Contagion, hints on the chemical character of, by Mr. A. Booth, 408
Cope and Sherwin's arming press, 337
Copper-plates, printing from, with altered dimensions, 216
Corn, tub for measuring and weighing, 313, 375
——, warehousing, 284
"Cottage, &c., Architecture," Loudon's Encyclopedia of, 82, 240, 280
Cottages, mile-stone, 81, 129, 174, 221
———, ornamental, 400
———, temporary, for Australia, 97
Cotton asparagus beds, 224
Cotton-gin, invention of, 430
Craighall coal-mine machinery, 321
Cranks, short and long, 40, 118

Croke, Sir A., and the Ashmolean society, 209
Cromford and High Peak railway, 140, 150
Crow's seaman's octant and traverse worker, 33, 168, 237
Croydon canal gas vacuum engine, 273
Crystals in living vegetables, 143
Cultivated and uncultivated lands, in the United Kingdom, 74
Curry, receipt for making, 37
Cuvier, 112, 144, 229
———, translators of, 349
Cyder presses, 128

D.

Dalton, John, 209, 210
Daniel, Professor, on the alleged decline of science in England, 114
Daubeny, Dr., and the British Scientific Association, 232
Davy's thermometric registrar, 145
Dean's submarine adventures, 364
Density of metals in a fluid state, 60, 126
Deposits, steam-boiler, 144, 416
Diak swords, 143, 246, 271, 294, 326
Dial plates, illuminated, 105, 190, 220
Diamond lens, the first, 445
Dickson's plan for purifying smoke, 353
Disinfecting process, Dr. Henry's, 284
Dispensaries, self-supporting, 341
Diving adventurers, 364
Dodwell, Mr., death of, 255
Drais', Baron de, triangle meter, 187; writing machine, 200, 304; improved velocipede, 417
Draining and ventilating mines with one apparatus, plan for, 329
Drawer knobs, secure fastening for, 297
Drawing-papers, 191, 239, 262, 356
Drummond's, (Lieut.), principle of representation, mathematical demonstration of, 68, 84, 119, 135, 171
Dudley and Ward, Earl, letter to, on coal-mine explosions, 85
Duncans, The, of Oxford, 206
Duties, effect of, on foreign imports, 218

E.

Earle's "New Zealand," 333
Earthenware furniture, 368
East, the, return of letters to, 254
Economical blow-pipe, 30
"Economy of Machinery and Manufactures," Babbage's, 213
Edinburgh and Dalkeith railway, 272
Education in America, 48
Egypt, modern, improvements in, 31, 141
Egyptians, ancient, mechanical skill of, 272
Emigrants, books for, 93, 130
——— guide, Pickering's, 130
——— pocket companion, Mudie's,
Emigration to the Canadas, 4, 93, 130
"Encyclopedia of Cottage, &c., Architecture" 82, 240, 280
Endless magic lamp, 18
Engiscopes, 447
English tongue, corruptions of, 13, 69
English and American settlers, 199, 256, 298
Enigma, mechanical, 249; solution of, 314
Ericsson's steam engine and water-mill, 401, 420
Excavators' waggon, 24
Exhibition of works of practical science, 158
Explosions, steam boiler, 111, 191
———, coal mine, prevention of, 41, 85, 121, 175, 264, 329, 352
——— of gunpowder, new mode of guarding against, 175

F.

Fairies, message from the, 203; answer to, 315
False horizon, Capt. Owen's, 384
"Family Cabinet Atlas," 303
Fancy fair, in aid of the subscription for the restoration of the Lady's Chapel, 240
Field gate, Irish, 251
Filter, cheap, 350
Filtration, upwards, 11
Fire engine, Braithwaite's steam, 127
—— escapes, 124, 165, 203
—— king again, 304
—— sparks from the magnet, 384
Flies, machine to keep off, 272
Flour-dressing machine, Smith's, 295
Fluids, motion of, 60, 126, 258
Food, animal, consumption of, in London and Paris, 75
——, new project for multiplying, 343
Foot-bridges over street crossings, 175
Fordham's air carriage, 224
Foreign scientific unions, 367
Forman, Capt., on the height of the atmosphere, 221
France, railroads in, 416
Franklin Institute, report by, on water power, 379, 393, 412, 419
French, scientific claims of the, 30, 148
——— Institute, report by, on steam navigation in North America, 421
——— window hinge, 282
Fulcrum of locomotion, 135

G.

Galvanic battery, new, 47
Galvanism, application of, to blasting rocks, 266
Garden hedges, 281
Gardeners, hint to, 368
Gas-burner, Taylor's improved, 177
Gas lamp, Andrew's oil, 296
Gas vacuum engine, Brown's, 273, 306, 326, 366

Gate, Irish field, 251
Geological Society, 208, 211
Geology, English, William Smith, the father of, 211
Geometrical quantities, maxima and minima of, 332, 351
Gibson, Mr. Jas., reciprocating saw by, 195
Gigantic observatory, 128
Gilbert, Mr. Davies, the Royal Society, and British Scientific Association, 207
Gold sands, 191
Gold and silver standards, 439
Gold mines of the United States, 48
Gordon on locomotion, 42
——— Mr. A., circular saw by, 195
Gradation of circular arcs, 185
Grass shearing machine, 345
Gravity of metals, 126
Greenock water-works, 305
Grenade, Mallet's hand, 442
Gresham lectures, 255, 267, 278, 336
Gun, new, for loading at the breach, 79
—— new percussion, 224
Gunnery, naval, 283
Gunpowder, Cornish mode of guarding against explosions of, 175
———————, safe process of manufacturing, 416
———————, yellow, 384
Gutteridge's Torricellian still, 9

H.

Hall, Sir James, 232, 255
Hamilton, Professor, the Royal Society of Ireland, and British Scientific Association, 207
Hancock's steam carriage, 31, 49
Hand, cunning of the, 112
Hand-grenade, Mallet's, 442
Harcourt, Rev. W. V., and the Yorkshire Philosophical Society, 209
Hardware manufactures, account of, 236
Hare's, (Dr.), application of galvanism to blasting rocks, 266
Harvey, Mr. Geo., on the British Association for the promotion of science, 167
Hats, solah pith, 10
Health societies, Self-supporting, 341
Heating with hot water, Saul's apparatus for, 90; experiments with, 101
———————, remarks on the various modes of, 109
——————— apparatus, Busby's, 251, 320, 336
——————— a dwelling-house and hot-house, by means of one pipe, mode of, 289
Helixgraph, or spiral tracer, Henderson's, 35
Hemming's safety blow-pipe, 210
Henderson's helixgraph, or spiral tracer, 35
Henry's (Dr.), disinfecting process, 284
Hinge, French window, 282
Holdsworth's revolving rudder, 161
Horizon, false, 384
Horse-shoe, improved, 362
Hot air baths, 47
——— blast, 143, 272
House-top deformities, 316
Housing the working classes, plans for better, 18
Humane Society blunders, 416
Hunter's screw press, improved, 24
Hydraulic cider press, Russel's, 1, 128
——————— presses, 48
——————— self-acting engine, 224
——————— volcano, Cagniard-Latom's, 31
Hydrostatic lavement instrument, 41

I.

Illuminated dials, 105, 190, 220, 259
Imperial arming press, 337
Imports, effects of duties on, 218
Inclined planes at Blaenavon iron works, 149
India rubber balls, 419
Indian alchemists, 411
Indian arts and manufactures, 37, 220, 411
Indigo, how to make blue for artists from, 320
Instantaneous light procurer, 328
——————— exploding hand grenade, Mallet's, 442
Interest and discount, 315
Invariable pendulum, 400
Iron roofing, 46, 61, 110, 181, 384
—— steam boats, 302
Italian agriculture, 255

J.

Jack, Mr. Thomas, circular saw by, 194

K.

Kensington observatory, 59
Kettle, steam, 93
——— holder, improved, 362
Knobs, drawer, secure fastening for, 297
Knowledge, advantage of a little, 32

L.

Ladye Chapel, restoration of the, 213, 240
Lamp, Andrew's oil gas, 296
——— blast, 314
———, endless magic, 18
———, Merryweather's platina, 146, 256
———, Potter's Polychrest, 17
Lands, cultivated and uncultivated, in the United Kingdom, 74
Lansdown's, Marquis of, principles of commercial science, 183
Lardner's, (Dr.), lectures on the steam engine, 389, 448
Lathe, improvement in the, 137, 400
Lavement instrument, hydrostatic, 41
Leather, Russia, 80
Lecount's method of rectifying the pivots of astronomical instruments, 330; discoveries in magnetical attractions, 341
Lectures, Gresham, 255, 267, 278, 336

Lectures, sleeping at, 284, 336
Leeds and Selby railway, 240
Leicester and Bagsworth railway, 192
Lens diamond, the first, 445
Letters, project for the quicker conveyance of, 218
Life raft, Canning's, 369
———, Rough's, 392
Light, properties of, 142, 169
—— procurer, instantaneous, 328
Lightning, singular effects of, 211
Linnæan Society, 208
Literary and scientific institution, North London, 16, 32
Literature and Locomotion, 31
Liverpool and Manchester railway, 345, 391
Locomotion abroad, 141
———, Gordon on, 42
———, principles of, 32, 56, 112, 136, 242, 265
Locomotive carriage, Ogle's, 136
———, Ruthven's, 256
London, steam carriages in, 31
——— bridges, Old and New, 45, 72, 195
——— street pavements, 63, 77, 147, 186, 222, 224
——— and Greenwich rail-road, 64
———, consumption of, 74
——— health of, 143
———, Cheltenham in, 143
——— and Birmingham railway, advantages of, 360, 367
——— steam carriage company, 192
Long shots, 384
Longevity, white and black, 48
Loudon's Encyclopedia of Cottage Architecture, 82, 240, 280
Lubbock, Mr., report on the tides by, 206
Lumbering party, 6

M.

M'Culloch's "Commercial Dictionary," 235
Macerone and Squire's steam carriage, 383, 407
Macgregor's "British America," 4
Machinery in Australia, 128
——— and manufactures, "Babbage's Economy of," 213
Magic lamps, endless, 18
Magnetic needle, 339
Magnet, fire sparks from, 384
Magnets, oxidated, 89
Mallet's hand grenade, 442
Malt, practice of drying, &c., by steam, 118
Manchester Philosophical Society, 209
Mason's improvements in locking the fore wheels of carriages, 225
Materials, economy of, 213, 215
Mathematical questions and answers, 20, 103, 134, 167, 263, 378
Maxima and minima of geometrical quantities, 332, 351
Measures, Prussian, 27
——— English standard, 375
Measuring corn, tub for, 313, 375
Mechanics' Institution, Mohawk, 176
Mechanical enigma, 249; solution of, 314
Medical police, 400
Megatherium, the, 239
Merryweather's platina lamp, 146
Metals, density of, 60, 126
———, steam producing power of different, 26
Mice, specific against, 240
Microscope jewel and doublet, by Pritchard, 446
——— pocket, by ditto, 447
"Microscopic Cabinet," 444
Miguionette troughs, 282
Mildew, &c., solutions of copper, an antidote to, 138
Mile-stone cottages, 81, 120, 174, 221
Milne's "Practical View of the Steam Engine," 322
Milton, Lord, speech of, at British Scientific Association, 206
Mines, coal, ventilation of, 41, 85, 121, 175, 264, 329, 352
———, draining of, 329
———, machinery of, 321
Mississippi, steam boats on the, 111
Mitchell's vapour bath, 202
Mohawk Mechanics' Institution, 176
Monsters, extinct, 368
Mordan & Co.'s oblique pens, 138
Morpeth, Lord, speech at the British Scientific Association, 210
Motion of fluids, 60, 126
Mortar firing, 384
Mudie's "Emigrant's Pocket Companion," 93
Murchison, Mr., the Geological Society, and British Scientific Association, 208, 211, 231
Murray's plan for communicating with stranded vessels, 122
——— fire escape, 124, 203

N.

Nails, how to tin, 112
Naval architecture, 188, 261, 297, 320
——— gunnery, 283
Newcastle and Carlisle Railway, 240
New Zealand, 333
Nile and the Red Sea, canal between, 146
Nimmo, Mr. Alex., death of, 255
North London Literary and Scientific Institution, 16, 32, 367
Nottington sulphur baths, 137

O.

Oaks's method of evaporating sugar in vacuo, 288
Obituary, scientific, 255
Observatory, gigantic, 128

Observatory, Kensington, 59
Octants, seaman's, 33, 168, 237
Ogle and Summer's steam carriage, 136, 156, 407
Ohio, the, inundations of, 2
——, number of steam boats on, 100
Oil gas lamp, Dr. Andrews', 295
—— paints, American substitute for, 304
Oiling machinery, on, 277
——-- railway carriages, 270
Oils, expression of, 336
Opinion, effect of, on price, 217
Outside show, and inside comfort, 400
Overshot water-wheel, comparison of Barker's mill with, 27
Owen's (Capt.), false horizon, 384
Oxford, grand scientific meeting at, 204, 227
Oxidated magnets, 89

P.

Paddles, sail worked, 103
——— superseded, 416
Paper, beet-root, 367
——-, Indian, 220
——-, drawing, 191, 239, 262, 356
Paradoxical theorem, 77, 185
Parallel motion, mode of dispensing with, in steam engines, 154
Parapets, designs for, 28
Paris, consumption of bread in, 74
Parliamentary representation, 171
Patents, new, 64, 128, 192, 284, 352, 448
Patent medicine man, 320
Pavements, street, 63, 77, 147, 186, 222, 224
Pedomotive carriages, 48, 80
Pen, Mordan's oblique, 138
Pendulum, invariable, 400
Penny press, 386, 415; in France, 336
Percussion gun, new, 224
Perkins' new improvements in generating steam, 91, 103, 158, 316
Perpetual motionists, a few words to, 190
Picken's "Canadas," 130
Pickering's "Emigrant's Guide," 130
Pitcairn islanders, 254
Pivots, Lecount's method of rectifying, 330
Plane, American carpenter's, 150
—— triangles, instrument for finding the contents of, 153, 295, 420
—— trigonometry, case in, 78, 300
Plants, Chantrey's mode of taking casts of, 216
Platina lamps, 146, 256
Pointing, errors in, 319, 351
Pontoons steam, 257
Potato flour, 176
——-- pan, improved, 265
Polychrest lamp, Potter's, 17
Powell, Professor, 227
Practical science, exhibition of works of, 158
Preserving French beans, parsley, spinach, &c., *Russian mode of*, 176
Press, Hunter's screw, improved, 241
Press, Cope and Sherwin's imperial arming, 337
Presses, cyder, 128
Price, effects of opinion on, 217
Primitive properties, 172
Printing, commemoration of the invention of, 367
———-, improvements in, 215
——— from copper-plates, with altered dimensions, 216
Prints, method of transferring from paper to wood, 55
——— mode of obtaining various sized, from one plate, 361, 377
Pritchard's "Microscopic Cabinet, 444; diamond lenses, 445; jewel and doublet microscope, 446; pocket microscope, 447
Projectiles, Murray's application of, to rescuing from fire, 124
Prussian weights and measures, 27
Public spirit, 31
Pump, double barrel air, 265
Pumps, creaking of, how to prevent, 323

Q.

Quarantine absurdity, 368
Quackery, patent medicine, 320
———- architectural, 398

R.

Railway, London and Greenwich, 64
———, Liverpool and Manchester, 96, 182
———, Cromford and High Peak, 140, 150
———, Stockton and Darlington, 173
———, Leicester and Blagworth, 192
———, Leeds and Selby, 240
———, Newcastle and Carlisle, 240
———, London and Birmingham, 360, 367
——— accidents, paucity of, 96
——— carriages, oiling, 270
——— performances, extraordinary, 96, 224
Railways, are they a nuisance, 173
——— and canals, 396, 415
——— conveyance of cattle by, 400
——— in France, 416
Rain, country without, 143
Rain-water, maximum weight of, 188
Rats and mice, specific against, 240
Red Sea, canal between the, and the Nile, 142
Read, Mr. Wm., on the loss from small stoppages of machinery, 45; iron roofing, 46; foot-bridges over street crossings, 175; a few words to perpetual motionists, 190
Registering operations, 215
Representation, Lieut. Drummond's principle of, 68, 84, 119, 135, 171
Revolving rudder, Holdsworth's, 161
Rice, Indian method of sowing, 37
Rifles, American, 32, 179

Rising in life, 128
River dredging, 214
Rochester wooden bridge, 143
Rocks, application of galvanism to blasting, 266
Rontree's improvement in steam engine valves, 96, 284
Roofing, iron, 46, 61, 110, 181, 384
Rough, Mr. M., plan by, for preventing losses by inundation, 2; fire escape, 165; life raft, 392
Royal Society of London, 207, 218
———— Edinburgh, 207
———— Ireland, 207
Rudder, Holdsworth's revolving, 161
Rudders, improvements in ship's, 268
Russell's hydraulic cyder press, 1, 128
Russia leather, 80
Russian iron roofing, 384
——— mode of preserving parsley, spinach, &c., 176
Ruthven's chirodrome, 256

S.

Safety-plate for boilers, 111, 272
Sail-worked paddles, 103
St. James's Park, proposed improvement in, 112
Salad-eaters, caution to, 283
Saturn and his rings, 48
Savage's vapour bath, 47
Saul's improved apparatus for warming by hot water, 90; experiments in heating by, 104; design for heating a dwelling-house and hot-house by means of one fire, 289
Sawing-machines, 193
Science, commercial, 51, 76, 183, 375
———, alleged decline of, in England, 114
———, exhibition of works of practical, 158
———, British Association for the Advancement of, 167, 204, 227
Scientific obituary, 255
———— Union, Foreign, 367
Scoresby, Mr., on effects of lightning, 211
Screw, new modification of the power of, 376
Screw press, Hunter's improved, 241
Seaman's octant, Crow's, 34, 168, 237
Seasons, changes in the, not imaginary, 46
Sedgwick, Professor, the Cambridge Philosophical Society, and the British Association, 208, 227
Sediment in steam-boilers, how to remove, 416
Self-supporting Dispensaries, 341
Serrulas, death of, 142
Settlers, English and American, 199
Shaws' Waterworks, 305
Sheathing for ships' bottoms, Wettersdett's, 381
Ship-building, 188, 261, 297, 320
Short-sighted, how to become, 142
Silk, American, 298
Silk from spiders, 73, 375
Silver v. Gold, 439
Simple clock, 25
Sleeping at lectures, 284, 336
Sliding-rule, 224
Sloth, the 230
Soane, Sir John, public-spirited conduct of, 31
Smith's flour-dressing machine, 295
Smith, William, the father of English geology, 211
Smith's Self-supporting Dispensaries, 341
Smoke, Dickson's plan for purifying, 353
Smoky chimneys, 358
Smut, &c., solution of copper, an antidote to, 138
Solah pith, new material for hats, 10
Spiders, silk from, 73, 375
Spiral tracer, 35
Spirits of wine, rectification of, 397
Spontaneous combustion of a balloon, 272
Staircases, how to save room in, 280
Statistics, American, 166
———, French and English, 74
Steam, power of different metals in producing, 26
——— Perkins's improvements in generating, 91, 103; proved to be fallacious, 316
Steam baths, 47, 202
Steam boiler, Buske, Keene, and Co's, 22, 48
———— deposits, 144, 416
———— explosions, 111
———— safety-plates, 272
Steam-carriage Company, London and Birmingham, 256, 102
Steam-carriage, Hancock's, 31, 49
Steam-engine, Milne's "Practical View of," 322
———, largest in Scotland, 322
———, Dr. Lardner's lectures on, 389
———— valves, Rontree's improvements in, 96, 234
———, mode of dispensing with the parallel motion, 154
———— and water-mill, Ericsson's, 401, 420
——— fire-engine, Braithwaite's, 127
——— kettle, 93
——— navigation, new claimant for the introduction of, 260
———, progress of, 7, 100, 132, 400, 421
——— pontoons, 257
———, drying malt by, 118
——— travelling, progress of, 125, 384
——— vessels, first, 260, 385
———, construction of, 102, 113
———, iron, 302
———, of war, 8
———, contest between, 22
———— on the Ohio, 100
———— on the Mississippi, 101
———, shaking motion of, 208

Steaming extraordinary, 16
Steel suspension-bridge, 192
Stephenson, Mr., and the Liverpool and Manchester Railway, 391
Still, Torricellian, 9
Stoppages of machinery, loss from, 45
Steps, improved cellar, 249
Stocking-frame, claim of the French to the invention of, 148
Street-crossings, foot-bridges over, 175
Street-paving, 63, 77, 147, 186, 222, 224
Stumps of trees, mode of extirpating in New South Wales, 155
Submarine adventurers, 304, 364
Subterranean fire, extraordinary, 400
Sugar, pure, from cane juice by evaporation in vacuo, 283
——, application of Brown's gas-engine to the boiling of, in vacuo, 315
Sullivan's method of oiling railway-carriages, 270
Sulphur baths of Nottington, 137
Sunken goods, raising, 304, 364
Surrey Institution, revival of, 30
Sussex, Duke of, and the Royal Society, 218
Sweating, or cholera baths, 202
Swords, Diak, 143, 246, 271, 294, 326

T.

Tachygraphical machine, Baron de Drais's, 200, 304
Tatooing art of, 334
Taylor's gas-burner, 177
Tea-makers, hint to, 383
Telescope, English claimant to the invention of the, 176
Terrific machine, 31
Thames Tunnel, 227
Theorem, paradoxical, 77, 185
Thermometric registrar, Davy's, 145
Tides, report on the, by Mr. Lubbock, 206
Timber, home and foreign, 163
——, preservation of, 112
——, machine for sawing, 193
Time, economy of, 213
Torricellian still, Gutteridge's, 9
Transferring prints from paper to wood, method of, 55
Trees, machines for felling and eradicating, 155, 184, 193, 250
Triangle-meter, Baron de Drais's, 187
Triangles, plane, modes of finding the contents of, 295, 420
Trigonometry, case in plane, 78, 300
Tristan d'Acunha, 333
Turning-lathe, 137, 400

U.

Uncultivated lands in the United Kingdom, 74
United States, gold mines of the, 48
——, statistics of, 166
Useful Knowledge Society, 126, 415

V.

Vacuum absolute, 120
——— gas-engine, Brown's, 273, 300, 326, 366
Vallance's, Mr. D., reciprocating-saw, 194
Valuation, case in, 172
Valves, Rontree's improvement in steam-engine, 96, 234
Vapour-baths, 47
Vases for parapets, 282
Vaulting extraordinary, 176
"Vegetable Substances used for the Food of Man," review of, 39
Vegetables, crystals in, 143
Velocipede, Drais's improved, 417
Ventilating and draining by one apparatus, 329
Vessels, stranded, Murray's improved plan for communicating with, 122
Vocal clock, 283
"Voice of Humanity," 303

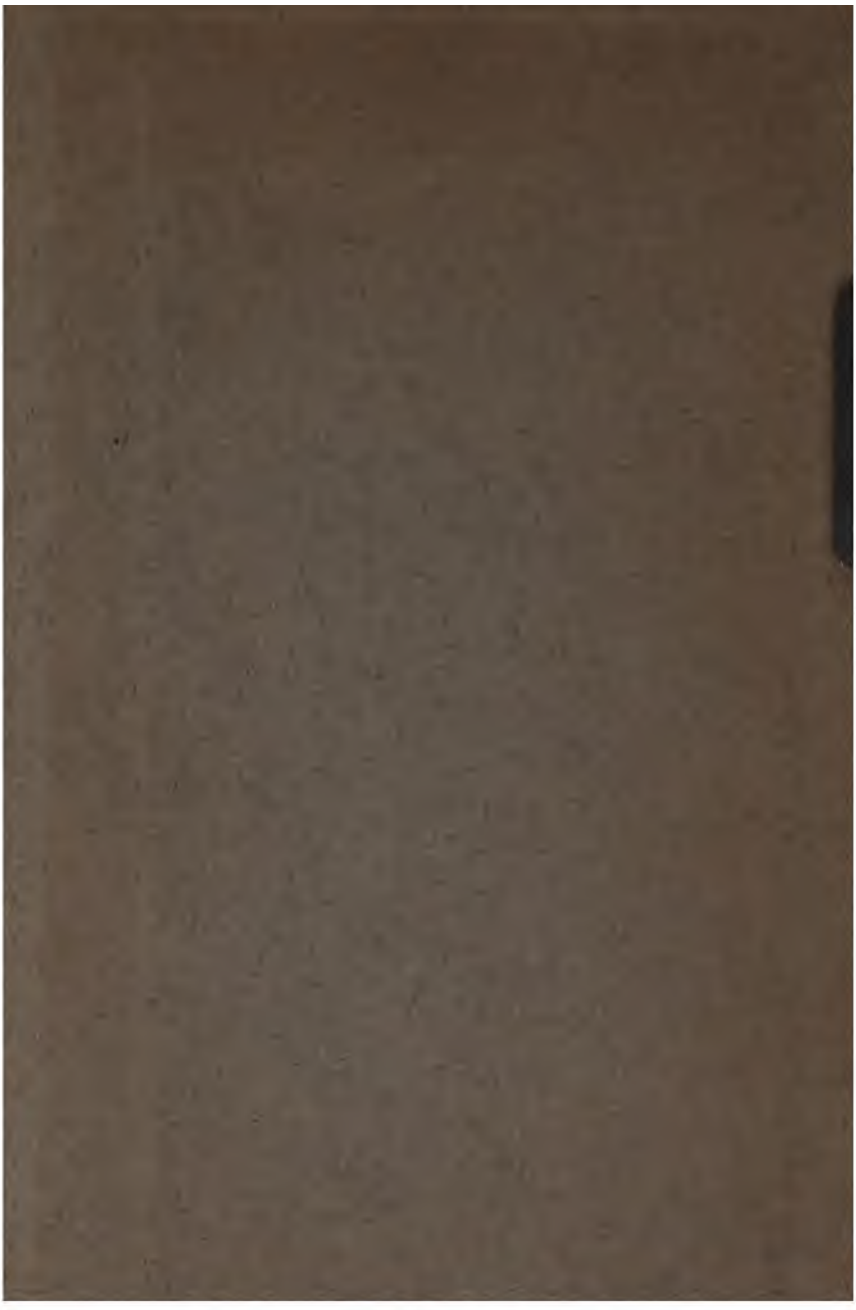
W.

Waggon, excavators', 24
Walker and Willat's filtering apparatus, 11
Warehousing corn, 284
War, steam-vessels of, 3
Wash-hand stand, 151
Water, filtration of, upwards, 11
———, boring for, 62
———, maximum weight of, 188
———, caloric from, 320
———, colours, 262, 356
——— mill, Ericsson's, 401, 420
———, power, report of Franklin Institute on, 379, 393, 412, 419
———, wheel, overshot, comparison of Barker's mill with, 27
———, works, Greenock, 305
Weighing corn, tub for, 313, 375
Weights and measures, 375
———————, comparison of Prussian with English, 27
Wettersdett's metallic sheathing, 381
Wheat, new species of, 17
Whewell, Professor, 207, 227
Whitney, Mr. Eli, memoir of, 430
Window-hinge, French, 282
Wonderful project, 141
Woollgar's, Mr. new pocket-rule, 9
Working-bees, 400
Working classes, plan for better housing the, 18
Wooden bridge, remarkable, 143
Wood-felling machines, portable, 98
Wood for bows, 144
Woods, British and Foreign, 163
Writing-machine, Baron Drais's, 200, 304

Y.

Yellow gunpowder, 384
Yorkshire Philosophical Society, 209

Z.

Zealand, New, 333

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